The Development of Agriculture In The Great Plains, As Typified By Its Growth in Kansas

by Wesley A. Lacey

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Submitted to the Department of Economics of the University of Kansas in partial fulfillment of the requirements for the Degree of Master of Arts

THE DEVELOPMENT OF AGRICULTURE IN THE GREAT PLAINS, AS TYPIFIED BY ITS GROWTH IN KANSAS.

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- A statistical study of the progress and results of the science of husbandry in the Great Plains area and its borderland. -

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by

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PREFACE.

In the decade preceeding the Civil War the tide of our population broke over its western shores and streamed to the Pacific. The plains over which it passed were to it but a desert and a hindrance. Even when the fertility of the prairies was recognized grave difficulties of climate and methods made cultivation hazzardous. But gradually the line of tillage has been pushed westward from the valley to the mountains in the wake of the migration tide. The chief thoroughfare over which cultivation has advanced and the chief field on which these difficulties have been solved is the commonwealth of Kansas. The struggle has been the most important and severe of agricultural America, and it is to the progress and results of the farm science in this region that this paper is devoted.

It is not the intention to "boost" Kansas. Our concern is with the Great Plains. Kansas, lying partly within and partly without this area and having a wealth of available statistics, is taken merely as ground over which to follow the march of agricultural production into the heart of the Great Plains. The arbitrary state lines

are respected in that they simplify the digestion of the statistics.

The size of the subject-field enforces brevity and omissions in many places. Points passed with mere mention could well sustain extensive study.

The science of agriculture has lagged throughout the world in common with its backwardness found here in the past half-century, although this section has had its special problems. To this retardation a chapter will be given before turning to the progress of the Great Plains.

(Difficulty has been found in giving a running bibliography, one statement or table often being derived from facts taken from several volumes. Where not otherwise stated the authority is in the Reports of the Kansas State Board of Agriculture for the years in question. The numbers in red ink correspond to references given at the end of the paper, pages 110, 111 & 112.)

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I

SOME REASONS FOR THE TARDY GROWTH OF A SCIENCE OF AGRICULTURE.

In the oldest and most important industry of our country, whose pursuit engages one-third of the population in the United States, and one-half in the State of Kansas, one would naturally expect a crystallized organization as early, at least, as in the minor and sequent trades; yet it is only within a comparatively recent date that science has been considered to be of any practical value to the farmer. But whatever the attitude of the past may have been the present proves that agriculture is not, by very nature, impossible of scientific reduction and formulation. The tardiness of its growth as a science can not be denied, but an explanation thereof must be sought not in the essence of the industry itself but in a multitude of potent tendencies incident to and concurrent with its pursuit. A few of the chiefest of these we shall notice, and shall discuss them merely as they have obtained in Kansas. If they fit other parts of the agricultural world then well and good; but whether they do or whether they do not is not our concern. In limiting the question to the one state we still have ample field for a far more extensive

study than can be made in this preface.

(1) The nature of the farmer's raw material discourages method. The man who manufactures shoes must secure his leather from a second manufacturer who is constantly striving to push the price up to the limit which the demand from the shoe industry will bear, and in the process the price will inevitably stand at a figure above that profitable to the least alert and methodical shoe producer. Thus the less capable and enterprising in the trade are continually being lopped off and the evolution of a higher industrial type and a fuller science fostered. This same is true in all the modern diversified industries in which the materials needed are forthcoming only from a second industry.

We must not make the mistake of committing ourselves to the statement that it is the quantity of the raw materials which makes the difference, for rather, as stated above, it is their nature, the peculiar uncertainty possessed by them. The sun may or may not shine persistently during the "growing" months; the rain may or may not fall at an opportune time. Some seasons Nature seems bounteous, some seasons niggardly. No man can predetermine

the year's climatic conditions closely enough to make the prediction the basis of any farming plan. Therefore, under previous methods of soil culture and farm management the variables were of too great influence to permit of any systematic calculations or specific workable rules. An industry deriving materials from a second will find the supply and cost of them tolerably stable, and under our present organization can, if desirable, bargain for delivery at a stated cost on a set date. Sunshine and rain are not listed on the exchanges, nor are they to be bargained for from any source. The materials which are so bargained for have a peculiar quality of tautness given to them from having a human agent back of them manipulating them on the least opening to the vender's gain and his purchaser's expense. In combat with this agency the skillful management and the efficient organization of the bulk of our present industries have developed. Particularly as long as new lands were to be had for a trifle and the farm was a self-sufficient community the agriculturist was free from this personal combat and free to wager with the rain and the sun that he would enjoy a good crop and to vie with himself in establishing a record for skill and knowledge of his trade, - neither of which is effective in promoting a

science or evoking man's fullest powers.

(2) To the influence of the climatic conditions of the Great Plains area of this latitude (37°- 40° N.) very much of the carelessness of the farming is traceable. It was the boast of Kansas devotees in the earlier days of the State that, owing to the prevalence of buffalo grass and mild winters, stock could "rough it " through the winter with neither grain nor shelter. It is true that they could, and do even to-day in some parts of the State, but it is needless to say that the suffering of the animals and the economic loss to the owners in a climate where there is an average winter temperature of thirty-one degrees Farenheit are enormous. Kansas comprises a median belt between the mildness of Texas and the rigor of the Dakotas. Its winters are not cold enough to make the building of substantial sheds and barns <u>imperative</u>, yet they are cold enough to occasion great loss through the exposure of the live stock. Were they colder or warmer the case would be bettered, for if colder no one would consider keeping stock without proper quarters, and if warmer the stock could thrive without such shelter. As it is a large part of the stock manage to exist with little or no shelter through

the winter months on feed gleaned from the stock fields and winter wheat, with an occasional stack of flax, oat or wheat straw to serve the double purpose of food and shelter. So, in the spring we find them long-haired, lean and listless. In fact it seems to many of our farmers as the natural order of things that stock should be poor in the spring, and then "pick up when grass comes". The stunting effect of this treatment on the young stock, especially the late calves and colts is very marked and harmful, and anyone who has lived any length of time on a Kansas farm will recall numerous cases where enterprising farmers have bought up colts from yearlings to three-year-olds when they were "run down" and by proper feeding and care doubled the money invested in a few months.

Again, the uncertainty and extreme variableness of the climate has doubtlessly had a great influence in discourageing method and care and encourageing indifference and carelessness in the cultivation of the crops; but to what extent this has been of effect would be a mere matter of speculation. This variableness of rainfall and temperature has also been a positive hindrance and check on cultivation in many ways and at all seasons, especially under the methods followed in

the past. The farmer has not been able to turn his attention to a certain task in its turn, but has had to wait upon conditions; his wheat and corn have lain in the ground weeks and even months after they should have been growing; excessive rains have kept him from the fields with his cultivators until the young corn was sodded with "crab" grass and "smart" weeds, or compelled him to lay it by, sometimes after the first time over; droughts have caught the corn at any period from the time it was waist high until it was in roasting ear reducing the yield to nubbins and compelling the farmer to cut and shock it; hot winds from the south have "fired" the stock up to the ear and in the space of two or three days given all the results of a heavy frost; wheat has ripened in the wet fields and blown down before the ground would hold up the binder, or has lain and rotted in the shock without drying out enough to thrash; flax has lain and moulded in the bunches as dropped by the self-rake, often after having been turned a half-dozen times with the pitch-fork in hopes of the rain ceasing. Thousands of acres of corn of a poor stand has been disced up throughout the state in June and planted in Kafir corn; and likewise enormous areas of the wheat which has winter killed has been planted in corn. The hay crop is truly subject to

its proverbial vicissitudes, and so, taking them all into account, it is not to be wondered at that the agriculturist of the state often becomes discouraged and feels like giving up and allowing these terrors - these against which his foresight and plans can avail nothing - to take his crops. Therefore, to repeat, this uncertainty which, although characteristic of agriculture generally, is very marked in the Great Plains surely has had some evil influence upon the attitude of the farmer toward his crop and its cultivation and has encouraged slip-shod methods.

(3) It is undeniable that the effective economic desires of the average farming population of the past have been simpler than those of the industrial and urban classes, dependence upon other trades and demands for the products of other industries being taken as the criterion. Instances proving this difference of desires are numerous in the cases of city folk who, accustomed to the habits and exchange facilities of the city, have moved to the country and have made a failure of farming not so much through poor farming as through the excesses of the requirements of their standard of life, and inability to simplify their standard to that normally developed under such rural con-

ditions. We must seek the cause of this simpler standard in the conditions of the farm life and can attribute it chiefly to the lack of communication which obtains in a trade whose members are necessarily separated not only from close touch with the markets of exchange, but are also separated widely from each other. The opportunities for gratifying and developing many of the desires for goods and services which are considered as among the necessaries of the city life are entirely absent from the farm, and thus the increasing complexity of wants which is found in the city is retarded in the country through this enforced isolation. This state of fewer requirements coupled with the fact that the farm of not many years ago was largely an independent economic organization has probably made the simple getting of a "living" easier on the farm than in any other occupation. The idea has prevailed, and with much reason, that any one could secure a livelihood in the country. In the majority of cases the secret of this lies in the ability of the individual to adjust himself to a standard of less demands. Because of the fewer needs of the life the marginal cost of production will remain low and the farmer's hope of profit must lie not in an increase of price for his product but in an

improvement in methods and a more intensive application of capital and labor to his land. With improved communication and transportation and the extention of their advantages to more and more of the farms the population is being drawn closer together in effect, denser settlement of the agricultural areas is actually placing families nearer each other, and the establishment of thousands of small towns is placing all nearer the world at large. These added facilities of exchange of goods and ideas are overcoming the segregation of the farmer and his desires are growing with the chance to gratify them. The economic self-reliance which was fostered under conditions of separation is gradually vanishing and the farmer is beginning to demand exchange with practically every division of the industrial organization. But even now a large part of the demands of the farmer, both incident to the pursuit of his trade and incident to the necessaries, comforts, and luxuries of his life, are met by the products of his own farm, many of which would have little value to him in exchange, but which would cost the townsman well to procure on the market.

This comparative ease of obtaining a living has detained the formation of any workable set of principles regarding the industry and has discouraged any vigorous investigation in methods. The increase of the needs of the farmer and his efforts to get exchangeable

products to offer in the widening market made possible through modern exchange is the great incentive to an agricultural science, which could not have arisen in a country such as this until the other trades of production and exchange and the academic sciences were tolerably well developed, and while the "natural science" side of farming can never hope to equal the advance of the sciences of botany, zoology and chemistry of which it is an application, yet it can keep close pace with their progress if the business side is useing its opportunities. (Although the above distinction of the phases of the science of the farm should properly be maintained , yet the term "science", as applied to farming, shall be used throughout this paper in the broader sense and include not only the knowledge of the natural sciences as they apply to farm problems, but also knowledge of business methods and farm economy.)

(4) The isolation of the farmer, spoken of above, has operated in various ways to produce the simpler standard of life and to retard the science of agriculture. The farmer's children have generally been deprived of any extensive or advanced education of any sort and so have missed the spirit of inquiry and progress which more naturally attend such education. They have plowed,

sown,and reaped after the manner of their fathers, earned a living, done nothing out of the ordinary, and left things as they found them. This is said in full recognition of the fact that many of our men of most remarkable minds and extensive influence have come from the country, for right there is the point, they <u>came from</u> the country and developed under a more energetic social environment. In leaving the farm they have left our field.

Due to their isolation the competition of the different farmers has not been effective and where it has existed has usually taken the form of a desire to get their crop in first, to "lay their corn by" first, or to be the first to "get their husking all done". Seldom, until late years, has the competition taken the form of a large yield per acre ,or low cost per bushel in production. The average farmer can do little more than guess at the cost to him of producing a bushel of any grain, and the yield per acre has been chiefly attributed to the season and to luck. The prevalence of the idea that potatoes will all "go to vine", or the corn all "go to stock" if planted during a certain phase of the moon, and kindred superstitions, in the past is astonishing; but advocates of this moon-farming

are fortunately becoming fewer.

(5) In his separation from society in general the farmer has to some extent lost the advantages of advances made along other lines which would have had a bearing on his trade. Part of the blame for this seems to be with the advance scientists in chemistry, zoology, and botany, in that they have not sooner made the practical application of their discovered principles to the problems of the farm, the most interesting and profitable field for these sciences which they are likely to find. Agriculture, embracing all of these, could not but wait for their growth. But the farmer must share the blame also, for undeniably he has been slow to use his chances, and until he is himself eager and earnest to consider all possible means of advancement all the science in the world will avail nothing. It can not make him a good farmer nor reduce the management of his farm to a mere question of machinery.

The precious "independence" given by farmers as their cause for remaining on the farm, -given by outsiders as their cause for going upon the farm, and bemoaned by those leaving or compelled to stay away from the farm, has, in spite of its democratic ring, had a baneful and stunting effect upon the industry, and to it

can be traced much of the lethargy and satisfied feeling which has prevented progress. Men must come into contact with others and fight for their portion and compete for results if progress is to be. The present shows such combat at work.

(6) Farm operations do not admit of the subdivision of labor to the extent to which this is possible in manufactures. The effects of this were recognized over a century and a third ago, for in the "Wealth of Nations" we find this statement: "The impossibility of making so complete and entire a separation of all the different branches of labor employed in agriculture is perhaps the reason why the improvement of the productive powers of labor, in this art, does not always keep pace with their improvement in manufactures."

In a factory the whole year is devoted to the production of the same article; on the farm only a part of the time is given to one product. Often the various crops are competitive and demand attention at the same season, as is the case with corn and the sugar beets whose considerable cultivation began in the center of the state in 1901 with a yield of 1,747 tons and grew, under a bounty of $5,000 each year for six years, to a tonnage of 102,462 in 1909. (The product for 1910 fell to 70,890 tons.)

So a diversified production best utilizes the labor, animal power, and capital given to agriculture. To realize the most from the farm, therefore, it seems entirely reasonable that the agriculturist should possess a much greater and wider knowledge than is required of a man performing a monotonous labor in a modern factory, or even in supervising the work of that factory. Both these functions - that of laborer and that of manager - must be considered, for in 93 per cent. of the cases the agriculturist of Kansas performs both. One man can not drill wheat, husk corn, nor feed cattle the entire year, and so that same complexity which demands that the overseer have a wide information also requires such information of the laborer who must shift daily and even hourly from one task to another. In this difficulty of specialization, then, we have a great cause of backwardness in agricultural development.

This combining of pursuits necessary to successful agriculture, together with other causes, has made the application of steam power - that great industrial leaven - less easy and less profitable, and has thus deprived farming of one of the main aids of modern industry. The possibility of this obstacle being over-

come exists, perhaps, in the field of electricity, if in any direction.

The depressed lot of the farmer of the immediate past is explained to a very great degree when we consider that agriculture has become for all purposes a virtual factory process ,yet has not employed factory methods. Thrown into active exchange with the other trades he has been manufacturing his corn, wheat, pork, and beef, and exchanging them for the goods which he requires, but in addition to the peculiar variables attaching to agriculture he has been handicapped by the omission of method and system where such were possible.

(7) Another advantage which the manufacturers have had over the farmers is that of more favorable tariff rates for the articles which concern them most, due to the fiscal needs of the government and to the momentum which these trades have thus obtained. One example is the Civil War tariff. Inaugurated for revenue requirements it fostered such a growth of manufactures that they have since been able to resist very effectively the efforts toward reduction. It is only within the last decade that the gains reaped by the agriculturist from this source have been as

evident as they are today.

During the last half of the nineteenth century, while American industries were flourishing behind the sheltering walls of tariffs, the lot of the farmer was depressed by an epoch of low prices for his products caused by an enormously increased production resulting from the exploitation of the new lands of the Mississippi valley, South America, and portions of the Old World.

The markets being flooded with wheat the cost of bread to the factory worker has been low, and thus the farmer has suffered to the profit of the industrial class. But the plethora seems ended and demand is catching up with production. Higher prices for farm products are ensuing and the agriculturist of the next half-century may expect a remuneration from the social income more commensurate with his contribution of labor.

Many more or less serious speculations are appearing from time to time concerning the world's future bread supply, and queries are made as to its source. Whatever of truth there may be in this trend will work to the advantage of the producers of this region, the typical wheat area of the world.

It is pleasing to note now that the crisis is passing and that, even though it is through compulsion, the determination and adoption of order and method are being carried out, by the farmer to some degree, and by the Agricultural College to a great degree. This aid of the college is popularly greatly underappreciated. It would scarcely be stating the fact in too strong terms to assert that the agricultural college has saved the agriculture of Kansas, - through the solution of the many vital problems which have arisen from year to year and the popularization of the discoveries of laboratory and experiment field. The deciples which it has acquired and enlightened throughout the state have been a literal leaven to the agriculture. The establishment of farming on an intelligent basis which is now sweeping the country portends great things for the immediate future, through its many agents, the increasing experiment stations, agricultural colleges, schools of state and federal support, agricultural education in primary and secondary schools, dry-land investigations, farmers'institutes, boys' corn contests, etc., etc.

Of course agriculture has not been passed over un-

noticed in any of the general progressive movements of the past,-it embraces too great a percentage of our population to admit of that; but the fact is noticeable that it has not been accorded the respect to which its importance in our industrial system would seem to give it claim. A mistaken contempt for the life of the farmer seems to exist among a woefully large number of that half of our people not connected with agriculture, and also among a surprising number of those who are so engaged. Those who are trying to "make something out of themselves" or to "make a success of life" seldom "settle down upon the farm". This aversion rests partly upon misconception and partly upon valid causes, the lot of the farmer whose farm has ceased to be economically self-sufficient and who has not yet adopted the improved methods of cultivation, better live-stock, modern machinery, new conveniencies, etc. being far from desirable or laudable. Certainly with the establishment of the New Agriculture every trace of this antipathy will vanish and the New Earth will find its just recognition.

II

KANSAS AND THE GREAT PLAINS.

1. Toward no section of the area of the United States has the attention of those interested in agriculture ever been so prominently directed as it is today toward that section known as the Great Plains. For convenience in treatment the boundries of this area have been definitely marked by common consent and as such are treated in all tracts of the Agricultural Department. It lies between the ninety-eighth meridian and the Rocky Mountains; the Canadian line and the thirty-second parallel[1]; and thus extends in a strip some four hundred miles wide from the centre of Texas to Canada on the slope from the valley of the Mississippi up to the base of the mountains and comprises portions of Texas, New Mexico, Oklahoma, Kansas, Colorado, Nebraska, North, and South Dakota, Wyoming, and Montana. (The map on the following page shows the portion of each included.)

This district holds a peculiar position as regards climate, lying on the transition area from the unquestioned agricultural surety of the Mississippi valley to the extreme hazzard of the cultivation of the mountain region. In its eastern and south-eastern parts it receives from twenty-five to thirty inches of rain annually

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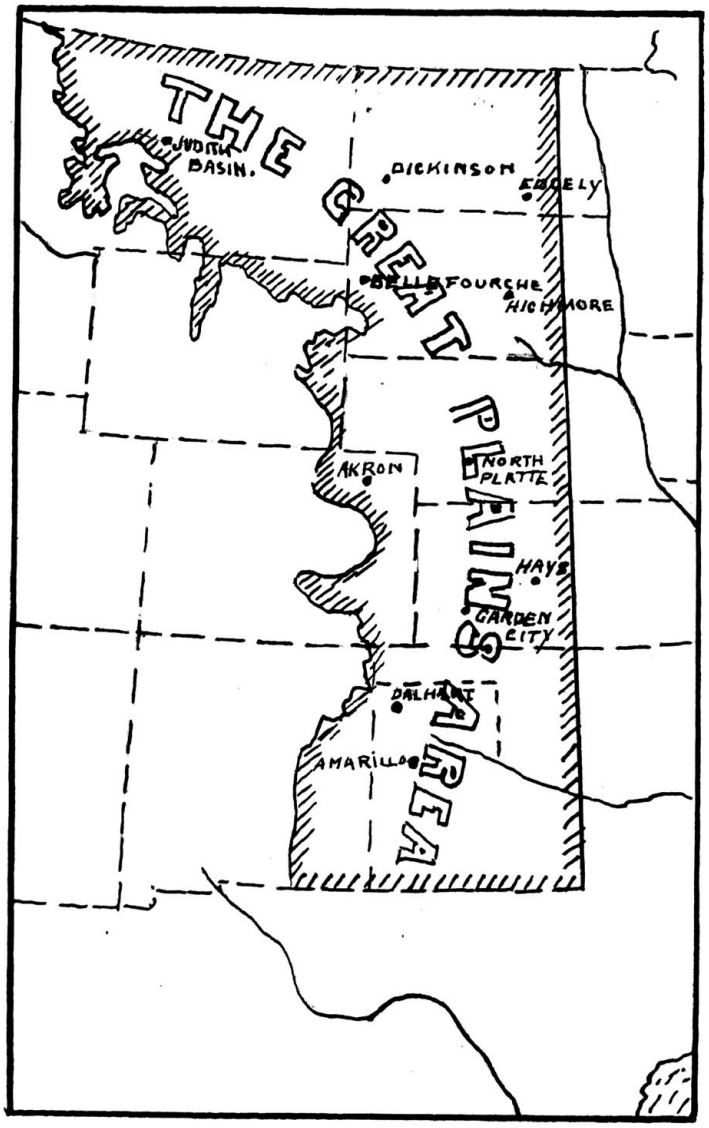

- Map of the Great Plains area, showing the location of experiment stations.

(From Bul. No. 187, Bu. of Plant Industry.)

with a diminution as we proceed westward and northward until only ten inches are to be found. (See map on the next page.) It is upon this field that the struggles for the conquest of the so-called desert have been waged. Bitter indeed have been the fights of the pioneer to extend the line of cultivation farther and farther into the land of the "parching sun" and the "cloudless sky". Many a volunteer has given his life's service to the cause and has sat powerlessly by as the ravages of the enemy have year after year robbed him of all that his work had accomplished. Unconquerable opposition has at times compelled a general retreat, but thru a tremendous persistence and a revolution in means and methods the advance has been continued so that today many who have watched the movement predict a total and final subjugation of the "Great American Desert". The simile is not fanciful; it is vitally exact and true and thousands can today attest to the fitness of its application.

The commercial location of the area is also worthy of note. It forms an important span in the connection of the east to the west and over its ground passes practically all of the transcontinental traffic of the country. Without navigable rivers, ore-beds, fuel, etc., it is unfitted for any extensive industrial development except agriculture,

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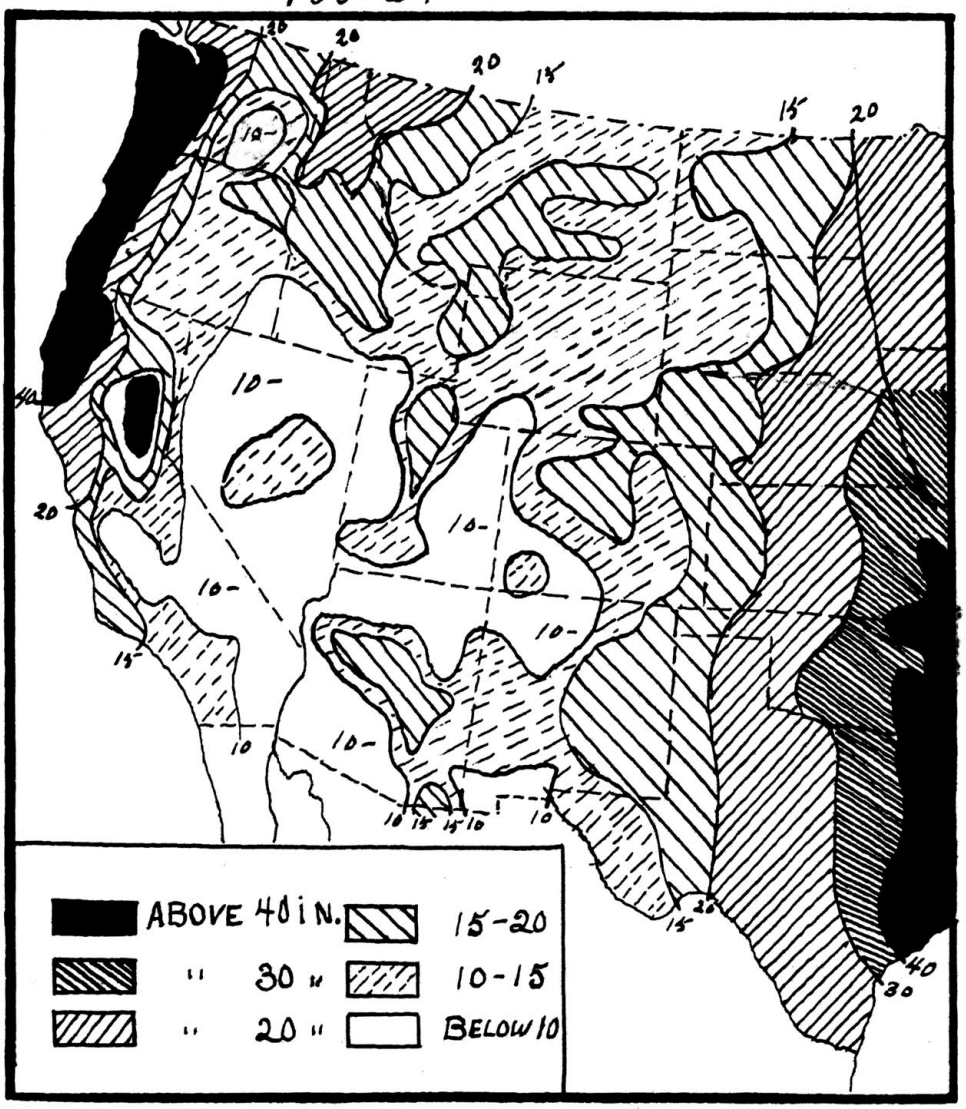


— CHART SHOWING DISTRIBUTION OF THE ANNUAL RAINFALL IN THE WESTERN HALF OF THE U. S.
(FROM BUL. NO. 188 OF THE BU. OF PLANT INDUSTRY.)
NOV. 5, 1910.

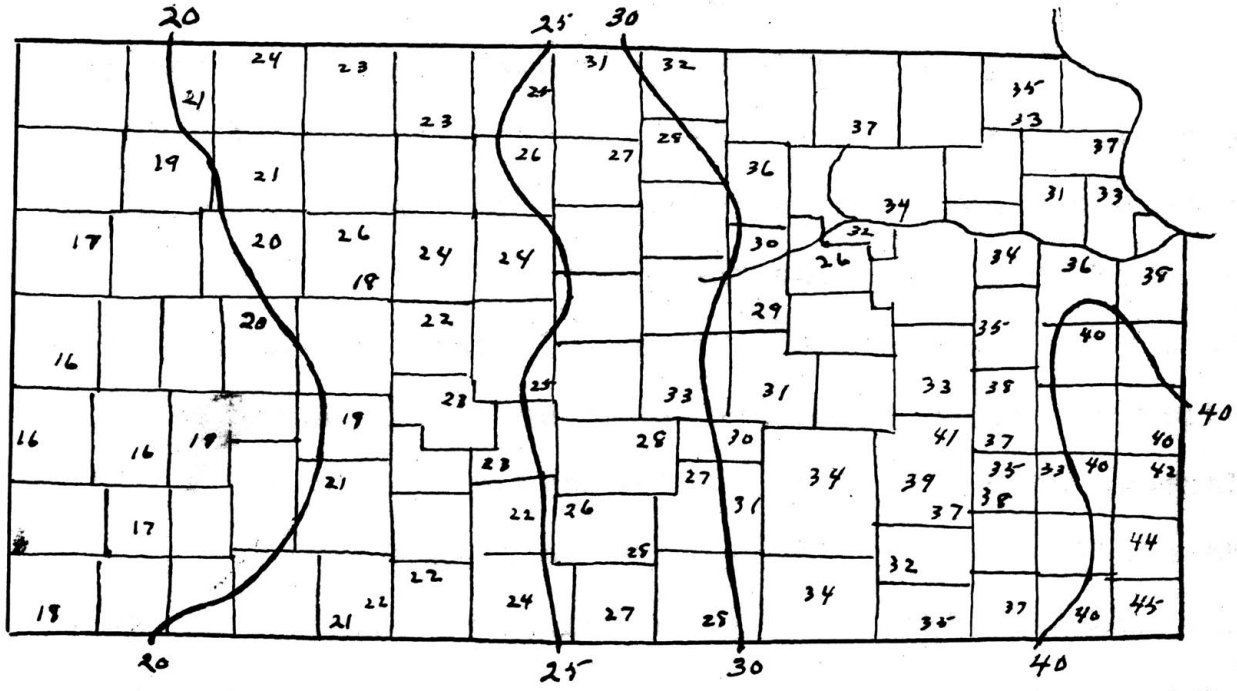
and to this it must always look as the work of its people and the source of its income.

2. Kansas, partly within this area and partly without ably illustrates all of the important problems characteristic of the territory, as well as being the ablest representative of the reforms which have resulted to so great a degree in the establishment of a permanent and certain organization of husbandry. And in addition perhaps the state can exhibit a few trials and remedies in farming which are peculiar to itself.

Kansas was admitted as the thirty-fourth state in 1861. Her territory lies between 94°, 38', and 102°, 2' West longitude; and 37°, and 40° North latitude, the north-east corner being cut off by the Missouri river. A little over half of the state is in the area assigned to the Great Plains, and accordingly we find an annual rainfall which decreases from over forty inches in the eastern part to about fifteen along the western boundry. The state is the chief highway over which agriculture has been advancing into the semiarid and formerly hopeless plains of the west, and statistics of the state's products chronicle the stages of the journey. (For rainfall map of Kansas with average figures for the last twenty years see the following page.)

The altitude of the state rises at an average rate of

No. 3.



- RAINFALL MAP OF KANSAS. THE FIGURES SHOW THE AVERAGE ANNUAL RAINFALL IN INCHES.

(From Bul. No. 188, Bu. of Plant Industry.)

Nov. 5,1910.

seven feet per mile from about 850 feet at the eastern border to 3650 at the western, -a distance of four hundred miles.

Although presenting a variety of landscape no mountains or swamps are to be found. The soil varies from a rich dark loam of limestone origin in the eastern part to a sandy composition in the western. Extremes of climate are absent and a death rate of 7.5 attests to its healthfulness.[2] The average temperature of December, January, and February for twenty years has been 31° F.; of June, July and August 74°, and the annual average 53°.

The state is well supplied with small streams along which in the eastern part of the state is to be found a considerable acreage of timber of a great variety. As the ascent up the inclined parallelogram of the state is made less and less timber is to be seen and portions of the western end are practically barren of any natural growth excepting narrow fringes along the larger creeks. Thus within the length of the state we have a range of soil, climate and landscape which has had its effect upon the agriculture and which is often overlooked when statistics of the state as a whole are considered.

3. The history of agriculture in Kansas does not begin until the close of the Civil War, which lasted in Kansas from 1854 to 1865. In 1855 the population of the year-old territory was determined at 8,601, and in 1860 at 107, 206. Out of this number Kansas sent more nem to the war than she had voters in 1861 (21,806 soldiers, as against 14,461 voters), and her mortality per thousand was the greatest of all of the states (61.01).[3] This decade was one then in which the progress of agriculture was greatly retarded.

The peculiar convulsions through which the strenuous young territory and state passed, in which men achieved fame for loyalty and fame for infamy, in which legislatures followed the capital from place to place, in which sociable neighbors from the border states came in to assist in the elections, and ambitious citizens made the round of a half-dozen polling places in a day and contributed as many votes in a place, in which freedom meant slavery and slavery meant death, in which the land was the juncture and contention of the warring factions, - all these have been too often repeated in national and local history, in reminiscence and address to require a word of further comment to show the mighty check which was laid upon all economic activity of this period in "bleeding" and "starving" Kansas.

From the time of the government survey of the Santa Fe Trail in 1825 Kansas was the scene of an extensive overland trade, and much of the population was made up of those engaged in the freighting, or located at the military posts or stations along the half-dozen wagon routes which threaded the state, and a large portion of its scanty farming was devoted to supplying hay and grain to the travelers, oftentimes at a truly monopoly price. Thus the principle farming operations up to the time of the Civil War were the harvesting of the vast quantity of prairie hay and the care of the cattle upon the ranges of the state , only such grains and other products being cultivated as could be consumed at home or disposed of to the wagon bands of the "commerce of the prairies".

Statements of the fertility of the country made by visitors of the time are exceedingly conflicting. To some the land was a garden, to others a desert. By considering the fickleness of the seasons and the climate this may perhaps be best explained.

Atchison, Leavenworth, Topeka, and Lawrence were founded in 1854, and during the fall and winter of '54 many settlers came into the Kaw valley and took up most of the available land. The wagon trails served to scatter the settlement over the country and prepare for a more rapid development than would otherwise have taken place. Mr. A. H. Reeder, first territorial governor, in his report to the Legislature in '55 said, "This population consists of 5138 males and

3383 females; and it is a fact worthy of remark as peculiar to a great extent of this Territory, that they are not, as usual, collected about one point or along a frontier line, but are dispersed over a district of over 15,000 square miles. This state of things, although it has its inconveniences at present, is, nevertheless, highly gratifying as it indicates that our Territory has many points of strong interest and promises an early development of our resources."

Abeline, Newton, Wichita, Ellsworth, Hays City, Great Bend. and Dodge City each had its day as the terminus of a cattle trail from the South to the railways which were pushing out through Kansas. The antipathy of the local stockmen to the longhorns of Texas led them to oppose their entrance to the state with legislation and rifles, and the Texas type moved westward and northward into Wyoming and mingled with the native breed giving us the typical cattle of the later plains trade.

The western part of the state, lying in the Great Plains area, was thought to be fit chiefly for buffalo and antelope, and even in the eastern part of the state the uplands were considered to be of little agricultural value, and the settlers kept to the valleys. In the charter of Bluemont College, a sectarian school which became the foundation of the State Agricultural College upon the passage of the Land Grant Act, approved July 2, 1862, there is provision for an agricultural department to experiment, among other things,

on the possibilities of the "high prairie lands".[5]

The Indians of the region gave the rancher, as well as the freighter, no little trouble, driving away his stock and destroying his hay and grain, their last raid being as late as 1869. In addition to those given to her native tribes reservations were given in Kansas to tribes of the eastern states, which policy was followed until 1854 when the system was begun which has sent them all away.

4. The war passed, the attention of the settlers was turned in earnest to the development of the farming possibilities of the state. In the next score of years a million and a half of people settled within its borders, coming singly and in colonies. War cares being over the West was receiving the attention of the whole country and Kansas was the most advertised part of the West. Cheap lands, low taxes, and the fascination of a "new country" were drawing the people into the grain districts of the West and Northwest. Professor Bogart, in his Economic History of the United States, cites as an example of the great increase of population in the spring wheat district the case of Minnesota and the Dakotas whose combined population increased during the decade 1870-1880 from 453,887 to 915, 950. That this was equally true for the winter wheat belt is shown by the fact that in the same period the pop-

ulation of Kansas grew from 364,399 to 996,096, her acreage of wheat springing from 156,200 to 2,444,434. It is not proper, though, to speak thus of Kansas as strictly a winter wheat state, for at this time spring and winter varieties were thought to be about equally suited to the climate and soil and were so rated in the earlier reports of the State Board of Agriculture,[6] which began with the report for 1872. Yet seeing the subsequent course of the two varieties we look upon the state now, which easily led the states in the production of winter wheat in 1900 with a yield of 13.15 per cent of the country's total* as a winter wheat state, the yield of spring wheat having actually diminished in quantity and being now restricted to the northwestern corner of the state.

The two decades 1870-1890 stand as a case of unparalleled advance in crop and live stock development. The cultivated area, i. e., the area from which a crop was actually reaped, grew from 1.3 to 17 millions of acres; the yield of corn from 16.6 to 273.8 millions of bushels (-in 1889, the largest yield in the state's history); the wheat yield from 2.3 tp 35.3 millions of bushels; oats from 3.6 to 49.9; the number of cattle increased from 372,000 to 2,370,000; and swine from 206,000 to 2,192,000. Railways increased their mileage in the state from 1,501 miles in '70 to 8,892 in '90, at which time only one state of the Union, Illinois, exceeded Kansas in its railway mileage.[7]

* CROP REPORTER, SUPPLEMENT, DEC. 1910, P. 95.

The assessed value of property, land, personal, city lots, and railway, rose from 91.6 to 347.7 millions of dollars, or a rise in actual value of from two to five times this amount.

The years 1881-1886 were highly prosperous and embraced the well-known "boom period" of Kansas. It was the boom of a new country. Corn and wheat were yielding well, land in the state was easy to obtain under the Homestead, Preemption, and Timber-Culture Laws, amazing possibilities loomed up in the near future, money was rushed into the state for investment from the East, agents for the lenders on real estate often took the land at its full enhanced value as security, funds were plentiful, and the people were developing luxurious tastes. In 1883 the Garden City district, comprising fourteen counties grouped in the south-western corner of the state, was almost untouched by the plow. A few stockmen grazed their herds on its buffalo grass. In 1884 immigrants began to settle in the valleys of the Arkansas and the Cimarron. The movement grew until in April '85 such a rush began as has never been equalled in the settlement of any of our states. The district spoken of contains some 7,246,000 acres. Between 1883 and 1888 over 6,000,000 of these were appropriated under the various acts for settlement, by far the greater part being taken

after '85. 25,000 farm houses were built. In 1885 there were six small towns in this area, small shipping points for the cattle-growers, in 1888 there were thirty-six towns here.[8] But the inflation of values and the growth of business had not a firm enough basis. The character of the country and climate had not been reckoned with. The yield of wheat, which had averaged 22, 19, and 21 bushels per acre in '82, '83, and '84 respectively, fell to 8, 8, and 6 in '85, '86, and '87. Corn fell from an average yield of 35, 39, and 41 to 33, 24, and 11, the year of '87 being one of severe drouth. In the general reverse of business which swept the country money ceased coming in, and the Easterners demanded payment of the farm loans. Many of the farmers were unable to pay and their lands passed into the hands of the large mortgage companies. Part of the tide of settlers had been boomers by trade, homesteading a quarter-section, selling their right and then moving on. Many of the bona fide settlers became despondent and retreated to the East or passed into other portions of the new West. The population of the state which grew from 996,096 in 1880 to 1,518,552 in 1888 fell to 1,338,811 in 1891 and continued low through the '90's, since when it has risen gradually to 1,696,361 in 1910.

The years closing the decade 1880-1890 after the collapse

of the boom were marked by a great depression which lasted from about 1887 to 1896, when higher prices and prosperity began to return. The importation of foreign capital having ceased the people had to look to their own industry for funds thru this period, and the strictest economies were practiced in attempts to pay off the debts contracted when money was easy.[9] The productivity of the state was affected but little by the leaving of the surplus population of professional boomers.

The '90's were a period of readjustment. The best lands of the state had been taken up, blind production was halted, and the farmer paused to look beyond his farm and understand that he is very intimately connected with the whole economic system. His plan of two or three crops of very similiar demands upon the soil and climate was proving faulty. The corn yield of 1889 was 273.8 millions of bushels while that of 1890 fell to 51 which, although an exception, this being the hottest and driest year for twenty years, served to show the dangers of too full a dependence on a few staple crops in such an uncertain climate.

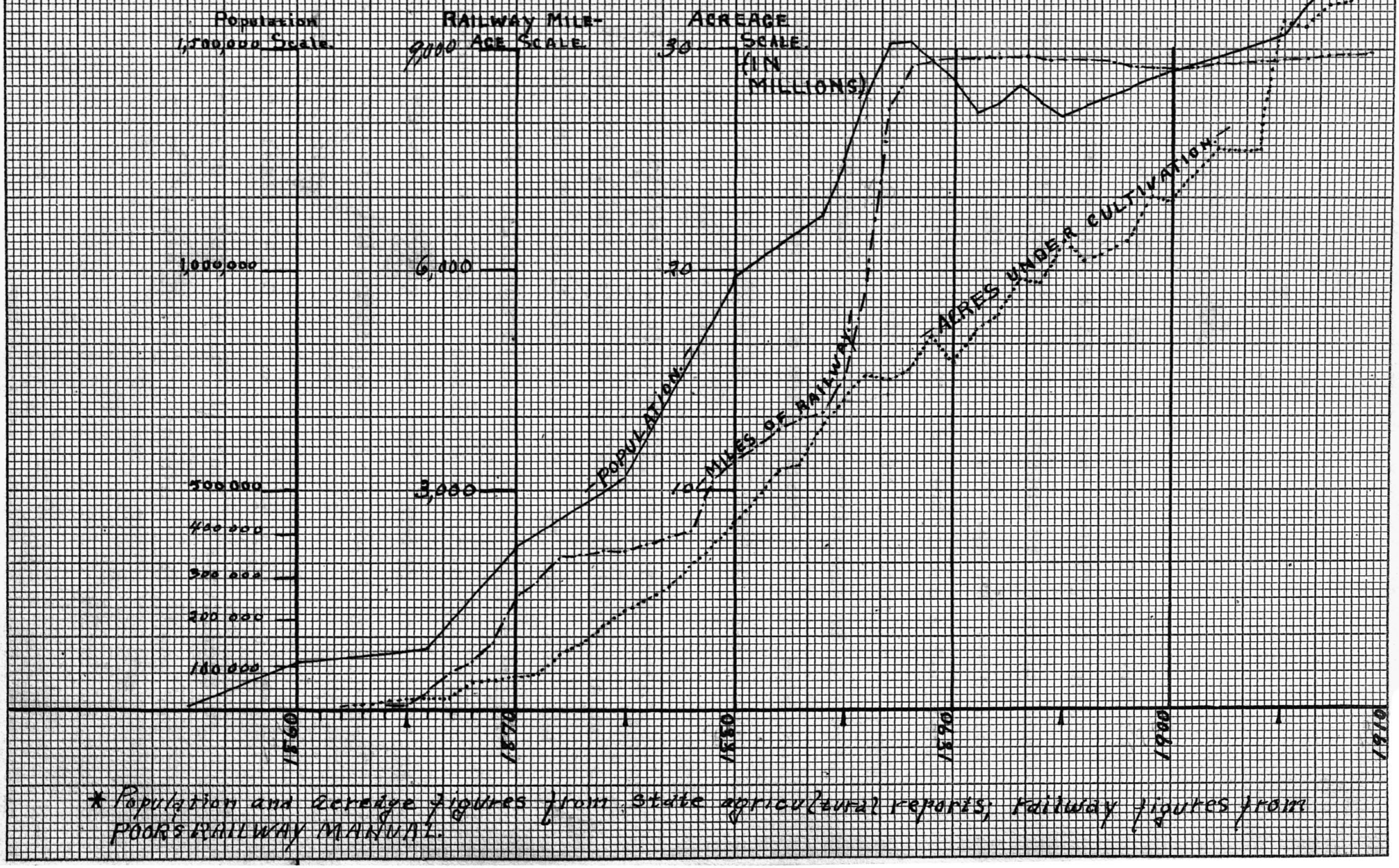
Farmers from the eastern states settling in the region just west of the Mississippi river fell into slovenly methods of tillage on account of the natural fertility of the soil. Oftentimes the land was plowed only every three or four

years, it being disked and the grain "stubbled" in the intervening years. These methods were retained as the settlement spread farther west into the more arid region. Although these methods proved fairly successful for a few years upon the new land, yet where moisture conservation is the important consideration they have resulted disastrously, The dry years ending in the drouth of 1894 showed the weakness of the system and served to depopulate a considerable part of the Great Plains.[10]

The agriculturist now began to study the climate and his ground and to adjust his crops and cultivation to them. As a result we have the great forage crop kafir corn appearing in 1893 for the first time in the state agricultural reports, and alfalfa in 1891. Experiments were begun to determine the best methods of moisture conservation, crop rotation, etc. More attention was given to the quality of the beef and pork than formerly, animals were put on the market at an earlier age and in better condition. Railroads were torn up where built in useless places during the boom period and, in fact, the whole industrial organization of the state was renovated, reorganized, and set going again in a sane and economical manner.

(The following map shows the course of population, railway mileage, and cultivated area. In it many movements mentioned in this chapter are graphically represented.)

No 4. Graph of the population, railway mileage and acres under cultivation in Kansas, 1860–1910. *



* Population and acreage figures from state agricultural reports; railway figures from Poor's Railway Manual.

III

FACTS OF AGRICULTURAL PROGRESS IN THE GREAT PLAINS.

The amount and territorial distribution of the rainfall of the Great Plains and of Kansas were briefly given in part second of this paper. The subject is taken up again under this third heading because of the general assertion that the climate of this section has undergone a decidedly favorable change. Although worn, the question is of such importance to our whole paper that a statement of the evidence seems very proper. To what extent can the wonderful growth of our farm products be attributed to any change for the better in the climate?

Various authorities "relying wholly upon the facts", the recorded data, have come to different conclusions on the question and upheld their decisions by combining the years' records in different manners, or by taking records of different stations. We readily see, therefore, that the change, which ever way it may have tended, is so slight as to be of no material consequence in accounting for an increased production.

The late Professor F. H. Snow, who for a period of about forty years kept accurate meteorological observations at the University of Kansas held the opinion that there had

been a noticeable change for the better in rainfall, humidity and windrun." Regarding rainfall he found an average annual fall of 34.91 for the decade 1868-1877, and of 38.16 inches for the decade 1897-1906; or, dividing the entire period 1868-1906 into two parts, as he deemed the fairest way, the following resulted:

1868-1887, average annual rainfall - 34.50 inches,
1887-1906, " " " - 38.14 " .

This gives a gain of 3.64 inches on the average, or over ten per cent, surely a material gain.

The average relative humidity he states in these figures:

1868-1887, - - - - - - - - - - - - 68.76,
1887-1906, - - - - - - - - - - - - 73.21; and the windrun thus:

1873-1882, - - - - - - - - - - - - 138,052 miles per annum,
1883-1892, - - - - - - - - - - - - 131,040 " " " ,
1893-1902, - - - - - - - - - - - - 122,012 " " " ,
1903-1906, - - - - - - - - - - - - 100,212 " " " .

This makes an average hourly run of 15.8 miles for the first decade, 14.9 for the second, 13.9 for the third, and 11.4 for the last four years. The last years given thus show a decrease of 27.7% over the first decade, which means a considerable saving in moisture through a decrease of surface evaporation. Professor Snow considered the conditions at Lawrence to be typical of eastern Kansas, and attributes the change to the increased area cultivated, the larger number of trees, etc.

R. H. Sullivan, in an article on"The So-called Change of Climate in the Semiarid West", in the Yearbook of the federal Department of Agriculture, for 1908, contends that the climatic conditions have not made any noticeable change beyond the irregular fluctuations from year to year, and that the illusion comes from the fact that more of the moisture is now absorbed, and better use made of it and less allowed to run back to the streams or evaporate from the surface. Prof. F. M. Ball, of the University of Minn., Prof. W. M. Davis, of Harvard College, and Dr. Julius Hann, professor of cosmic physics in the University of Vienna, are quoted in support of the idea that any change in the movements of the voluminous atmosphere through the infinitesimal alterations which man may effect in the surface conditions is imperceptible. Prof. Willis L, Moore, chief of the United States Weather Bureau, is quoted as follows:

"It is my duty to publish the simple ungarnished facts in regard to the climate of the United States. Our people want the truth so that they may not be mislead by those who honestly, but nevertheless ignorantly, claim that hot winds and droughts will never come again; or by those who, when periods of deficient rainfall come, as they have in the past and as they certainly will in the future, preach discouragement and abandonment of lands which on the average of a long period of years it would be profitable to cultivate.

"I have made careful examination of the government records, with a view of putting before those interested in the matter, a correct statement regarding the rainfall and the wind of both Kansas and Nebraska. * * * The government records, as is well known, are in a class separate and distinct from the recollections of the oldest inhabitants, * * *"

Chief Moore then gives the following table:

Mean rainfall at the stations named.

Station	Period of observation.	For the full period	For the 30 yrs. 1877-1906, in periods of ten yrs. 1st	2nd	3rd	Mean.
Denver, Colo.	1870-1906	14.0	14.5	13.4	13.4	13.8
Dodge, Kans.	1875-1906	20.8	22.8	18.4	22.7	21.3
North Platte, N.	1875-1906	18.7	20.1	17.2	19.8	19.0
Independence, KS	1872-1906	37.1	39.1	35.5	38.1	37.6
Genoa, Nebr.	1875-1906	28.2	26.3	26.4	31.3	28.0
Manhattan, Kans.	1858-1906	30.6	33.4	29.2	31.9	31.5
Lawrence, Kans.	1868-1906	36.4	35.1	39.2	36.7	37.0
Omaha, Nebr.	1871-1906	30.7	37.6	25.6	27.9	30.4
Minden, Nebr.	1878-1906	31.5	36.1	29.2	29.8	31.7
Oregon, Mo.	1866-1906	35.6	37.1	32.3	39.5	36.3
Keokuk, Iowa.	1872-1906	35.0	35.4	31.4	35.1	34.3

"The averages in the periods of ten years each appear in the table, from which it may clearly be seen that the first and last ten years were periods of fairly abundant rainfall, and the middle ten years a period of deficient rainfall.

"The heavy rains of 1906, and also the year previous, were common to all that vast stretch of territory west of the 99th meridian. It was not a local phenomenon centered in western Kansas and western Nebraska, since equally heavy rains fell in Colorado, Utah, western Texas, Oklahoma, New Mexico, Arizona, Nevada, and central and southern California."

Regarding wind velocity the following table is given in Sullivan's article:

Station	Years' observed	Average velocity per hr.	Average difference in velocity per hr. between whole period, and 1889-98	1899-1907	1889-1907
Amarillo, Tax.	16	15	+2	-1	0
Bismark, N. Dak.	34	10	0	0	0
Concordia, Ks.	23	8	0	0	0
Dodge City, Ks.	33	12	0	-1	0
Huron, S. Dak.	26	12	0	0	0
N. Platte, Nebr.	33	10	0	-1	0
Okaa. City, Okla	17	11	-1	+1	0
Omaha, Nebr.	37	8	0	+1	0
Rapid City, S. D.	20	8	+1	-1	0
Wichita, Ks.	19	9	0	0	0

Tables similiar to the above one are given for the number of rainy days, and for the humidity at the same stations, showing how the fluctuations offset each other and leave a difference of practically zero.

The Salton sea, to which credit is sometimes given for the increased rains of 1905 and 1906, was not formed by the Colorado until after the heavy rains of the spring of 1905, and it has been estimated that the excess of rain above the normal for 1905 in Arizona alone would have equalled twelve times the volume of this body of water. [12.]

The rainfall for Ft. Leavenworth has been recorded longer than for any other point in the state. Divided into decades the average annual precipitation is:

1837-1846 - - - - - - - 30.47 inches,
1847-1856 - - - - - - - 32.31 " ,
1857-1866 - - - - - - - 33.73 " ,
1867-1876 - - - - - - - 38.74 " ,
1877-1886 - - - - - - - 38.04 " . [13]

For Manhattan the average annual rainfall has been:

1854-1863 - - - - - - - 27.25 inches,
1864-1873 - - - - - - - 27.45 " ,
1874-1883 - - - - - - - 32.49 " ,
1884-1886 - - - - - - - 28.65 " . [14]

The fall at Concordia since 1886 averages 26.+ inches yearly from 1886 to 1896, and 28.+in. from 1897 to 1907.[15]

From the foregoing the conclusion is to be drawn that there has been an apparent, small increase in the rainfall for Kansas. Whether this is a permanent change, or merely erratic fluctuations through the years without cause for continuance is indeterminate. But whether permanent or not it is so small that its infuuence must be very slight. The important gain which has been made, however, has been effected by man himself in the improved means of moisture conservation. As more of the prairie sod was broken more of the rainfall was absorbed by the ground and not allowed to run off into the streams as formerly. The decreased discharge of the streams of the state attest to this. The moisture so caught by the soil,

even under the crudest methods of cultivation, was put to a proper use in producing crops which in turn added to the humus and moisture-retaining powers of the soil. By the cultivation of the surface a damper was put on the evaporation and the land was able more and more each year to weather a drouth. Again and again of late years we have seen the statement that the problem of the Great Plains is not one of rainfall but of evaporation. The rainfall, coming as it does in the growing season, is held to be quite sufficient for the production of the average crop if the surface evaporation can be kept down. If this principle could have been generally known and heeded by the farmers of the state from the first it would have meant a vast saving and a far earlier maturity of the farm science.

The seasonal distribution of the rainfall of the Great Plains is exactly the reverse of that on the Pacific slope, about three-fourths of the year's total falling in the six months from April to September, inclusive. [16]

Below are given the monthly and seasonal averages for four Kansas towns, representing different sections of the state, Leavenworth, the north-eastern corner, Independence, the south-eastern part, Dodge City, the south-western, and Wallace, the extreme western part.

	Apr	May	Jun	Jul	Aug	Sep.	Total for season	Nunber of years obsd.
Leavenworth	2.9	4.4	5.4	4.0	4.1	3.6	24.4	57
Independence	3.7	4.6	4.9	4.2	3.0	3.7	24.1	25
Dodge City	1.8	3.1	3.3	3.2	2.8	1.3	15.5	22
Wallace	1.6	2.8	2.3	3.4	1.7	1.3	13.1	18

For such statistics the state is often divided into three nearly equal parts, the eastern, middle, and western divisions. The rainfall of the divisions has varied as follows, for the period 1887-1907, inclusive. [17]

Division	Minimum year	Maximum year
Eastern	26 inches	45.71 inches
Middle	18.58 "	34.30 "
Western	11.93 "	29.21 "

DRY FARMING.

Above we have seen that the rainfall, coming chiefly in the summer months, is sufficient for all purposes in the eastern division. In the middle division it is less and more care must be used in selection of crops and in their cultivation. Stockraising is profitable and wheat here finds its greatest stronghold. The western division has at best a scanty supply of rain. The evaporation from an exposed tank at Garden City in 1908 and 1909 was found to be 59.9 inches each year for the season from April to September, inclusive.[18] It is this which has ruined fortunes and faith in this part of the state, and it is against this that most earnest efforts are being directed. The farmers are learning to make the most of the climate. The Office of Dry-Land Agricultural Investigations

is now working out the problems of the fertile but semi-arid districts and endeavoring to determine what system of cultivation will best conserve the moisture of the soil for the use of the crop. The Department cooperates with the state experiment stations, of which eleven were established during 1908 alone.[19] Dry-land investigations are in progress at Judith Basin, Mont.; Dickinson and Edgely, N. Dak.; High-more and Bellefourche, S. Dak.; North Platte, Nebr.; Akron, Colo.; Hays and Garden City, Kans.; Amarillo and Dalhart, Texas.* In January, 1907, a Dry-Land Congress was held at Denver to encourage the spread of the new theory.[20]

The Campbell system embraces the features of dry-farming in general, and so a description of it will serve for both.[21] The central idea is to check evaporation.

1. Plow 8-10 inches deep.
2. Pack with a subsurface packer with wedge-shaped iron wheels, which packs the soil but leaves a loose surface.
3. Stir the surface after rains to keep a blanket of two or three inches of dust on the ground to prevent evaporation. Harrow until the grain is three or four inches high.
4. Where the ground can not be plowed at once after harvesting follow with the disk harrow, as a great amount of moisture will be lost in a few days after

* SEE CHART NO. 1.

the removal of the grain from the field. Then plow deep and use the packer.

This rain economy is a new feature in agronomy and where the system has been given fair test has shown remarkable results. A crust aids evaporation, therefore the harrowing after each rain if possible. The deep plowing gives a receptacle for the retention of the rainfall. Any improvement in the production of the cereals and forage is especially accepfable in the western part of the state because of the added feed it would give for stock-raising, which is and will remain the chiefest concern of this division. But dry-farming is only one of the problems of the plains, and its perfection does not put agriculture on a sure basis in this area.

PESTS.

In addition to drouth such hindrances as hail, high winds, frosts, insects (grass-hoppers, chinch bugs, green bugs, brown-tailed moths, etc.), diseases of grains, trees, and live stock, prairie dogs, gophers, field mice, wolves, and many minor pests have worked great damage to the farmer of the region and prevented the pushing of the centers of production westward. Dry-farming increases the cost and occasions the greater loss when crops are destroyed by these pests.

Gophers are distributed over the whole state and a con-

tinual war is being waged against them with traps and poisons. They eat the corn before it comes up, and thin out the alfalfa plants and throw up mounds which obstruct the mowing machines. "The loss from gopher depredations to the alfalfa growers of Kansas during 1901 was probably one-tenth of the entire product and had a money value of at least $500,000." [22] (This is the statement of Prof. D. E. Lantz, formerly in charge of the field work of exterminating these pests.)

In 1909 an act was passed placing a bounty of 5 cents each on pocket gophers and crows, and one cent on crow eggs.[23] County clerks have also been authorized at different times to pay bounties.

The habits and ravages of the peculiar prairie dogs of the plains with his populous villages of acres and acres are common knowledge, and are of such concern that the state has taken the work of exterminating them up in a systematic way. For example, in 1901 an appropriation of $5,000 was made for this work,[24] and provisions made for the purchase and use of poisons throughout the state. In 1909 an act was passed empowering township trustees to levy a tax and purchase poison for the work.[25] This, together with the fight against the gophers , is under the supervision of a general field agent, and in this work Kansas excells the other states in effectiveness.

Although a wholesale loss of crops by the migratory Rocky Mountain locust has not occurred for years, and is not likely to since the breaking up of the adjacent territory in which they bred, yet much damage is now done by the local grass-hoppers, especially in the alfalfa.

Since 1878 no serious damage has been done in Kansas by the locust; the number of annual visitations during the period 1950-1878 in the various states was: 26

Utah	26	Wyo.	10
Minn.	18	Mo.	8
Mont.	18	Idah.	5
Daks.	17	I. T.	5
Tex.	15	Nev.	4
Iowa	15	Wash.	4
Kans.	14	Ore.	4
Nebr.	13	N.Mex.	3
Colo.	12	Ark.	2

The year of most damage in Kansas was 1874, the "grasshopper" year.

Great success has been achieved in dealing with all the pests, mainly through the work of the State Agricultural College and the State University, and some of them, the chinch bug, for example, have been the cause of no little work and expense.

IRRIGATION.

Comparatively little has been attempted or accomplished in artificially providing water for the crops of the state. The vast areas and the required expense has held the farmer

back. In 1896 1,335 farmers reported irrigation devices treating a total of 11,823 acres.[27] Wind pumps are chiefly used, the western part of the state being underlaid with a surprising supply of good water. In the valley of the Arkansas many ambitious attempts were made to establish an extensive system of irrigation canals in the '80's and '90's, but the supply of water was not reckoned with closely enough, the canals lying dry during the months when the river's flow was beneath its sandy bed. The chief use of these now is in the raising of forage.

CROPS.

Kansas is true to her classification as one of the "winter wheat and corn" states. In 1909 the value of her winter wheat and corn crop aggregated 158 millions of dollars out of a total of 307 millions for all the farm products (field crops, horticultural, live stock sold for slaughter, or slaughtered, wool clip, dairy products, poultry, eggs, etc.). Because of the lighter wheat crop due to the unfavorable winter, and the lower price of corn the ratio for 1910 stands at 128 millions of dollars for wheat and corn out of a total of 304.[28] Thirty years ago the ratio was 66/122; twenty years ago 88/169; and ten years ago 71/195. In 1909 the winter wheat was valued at 75 millions, the corn at 83, in 1910 the winter

wheat at 52 and the corn at76. In only seven different years has the wheat crop exceeded the corn crop in value. there years are 1878, 1890, 1897, 1898, 1900, 1901, and 1904. These are all years of unusually low yield per acre for corn, excepting 1878 when an increased acreage of wheat and a larger average yield per acre than for eleven years previous gave wheat the advantage.

The next single crop in value after wheat is the oat crop, although taken collectively the tame hays have exceeded in value since 1901 (1903 and 1910 excepted) oats always having lead before this date.

Tame hays, taken thus, include timothy, clover, blue-grass, alfalfa, orchard-grass,etc. Of late years alfalfa has furnished over half of the total tame hay acreage. Tame hay also deserves to rank before oats because of the greater place it fills in the stock-raising

Wild, or prairie hay holds the next place, although kafir corn has exceeded it in value five different years (1898, 1899, 1902, 1904, and1908).

In addition to the major crops just mentioned the following are produced in sufficient quantity to find a place in the reports of the State Board: spring wheat, rye, barley, emmer ("speltz"), buckwheat, Irish potatoes, castor beans, cotton, flax, tobacco, broom-corn; the garden and horticultural products range in value from one to four millions of dollars each year.

CORN.

The two concepts of Kansas and corn are inseparably joined. Corn has been the reserve of the Kansan's resources. He has raised all of it that he has dared to raise. Its simplicity of production has kept the supply up to the maximum and the price at the minimum since the beginning of the state. Being a bulky grain its market is mainly local, probably three-fourths of it being consumed in the county where grown. When the crop has been greatly excessive of the needs of the home market for stock-feeding it has even been consumed as fuel, or has lain in heaps and rotted. Recollections of such are only too familiar to the farmers of the state.

Converted into hogs and cattle the corn obtains cheaper transportation, and, since the establishment of the great packing houses within the reach of the state (at Omaha and Kansas City), the shipment of the pork and beef has reduced the weight still more; and it is chiefly in this form that the corn crop of the plains now finds its ultimate market.

It is due to this limitation to home consumption that the price of corn has fluctuated far more than that of wheat. The largest crop that the state ever produced, 273,888,321 bushels in 1889, is valued in the reports of the State Board at less than nineteen cents per bushel,

and did not equal in value the crop of the previous year which was 168,754,087 bushels.

A short crop in this cereal always means not only a higher price of corn but also an immediately lower price for the stock dependent upon this crop, i. e., hogs and cattle. Of course this condition can not last long if the price of corn continues high, since cheap animals can not be raised on costly feed. The price for the past ten years has shown a continued high mark, concurring with the high price of beef and pork. Indeed, the prices of all the farm products for the last decade have been decidedly more favorable to the farmer than formerly

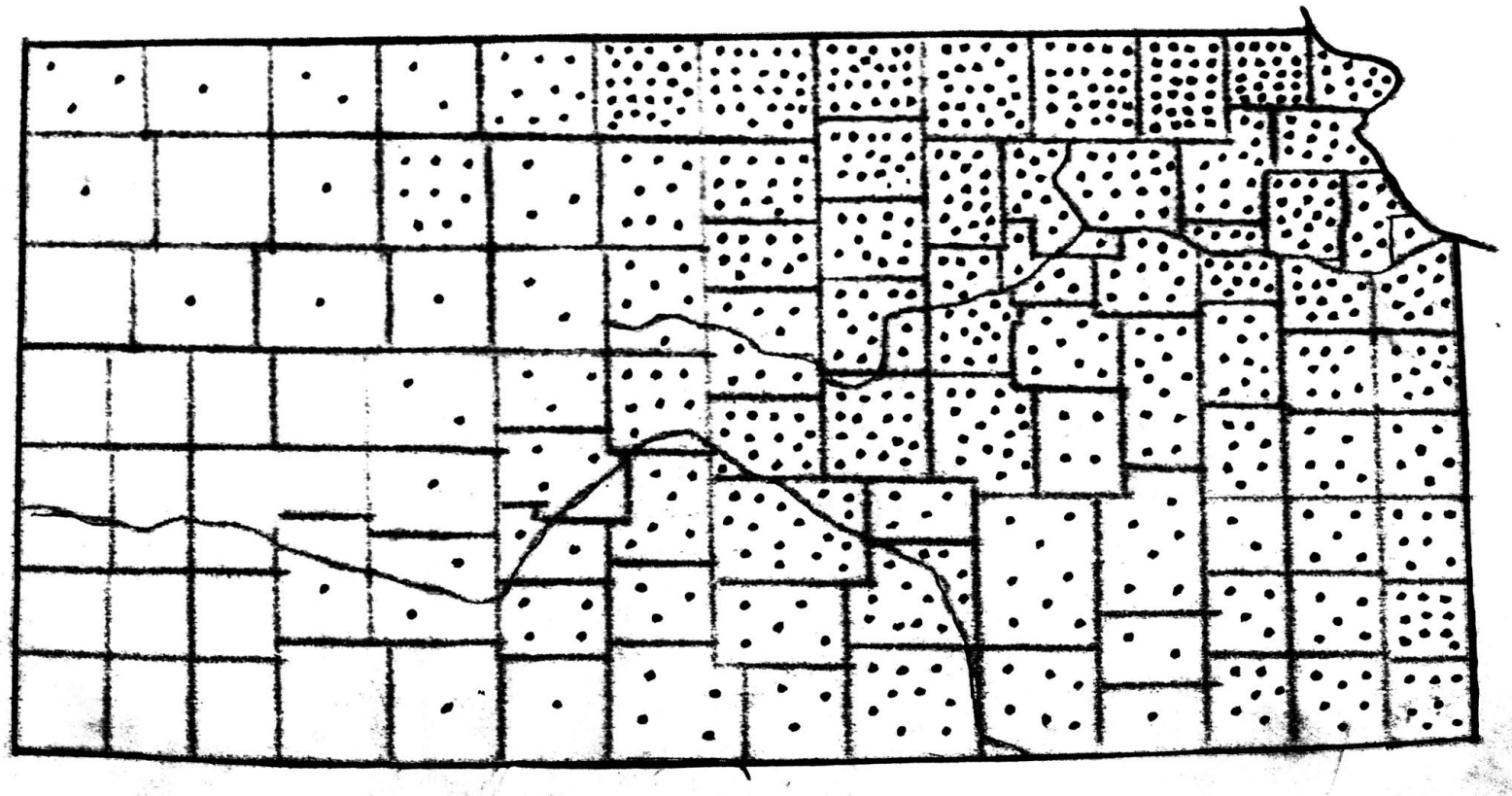
For the year 1875 845 bushels of corn were raised for every person over twenty-one years of age engaged in agriculture in the state; for 1885 there were 876 bushels; for 1895 1086; and for 1905 756.[29] These years are fairly typical of their periods. The production for 1889 reached the enormous amount of 1369 bushels per person so engaged.

The Great Plains proper are not a corn country. Although none of the 105 counties of the state reported less than a thousand acres for 1910, and only eleven less than ten thousand, yet the cultivation is most general in the central, north-central, north-eastern, and eastern parts of the state. (See the map on the following page.) Seven counties for 1910 furnished over 4,000,000 bushels

No. 5.

DISTRIBUTION OF CORN, 1910,

one dot representing 200,000 bushels.



From data from quar. rep. S.B.A. Dec. 1910.

5.2.

each. These counties are Brown, Nemaha, Marshall, Washington, Republic, Jewell, and Smith, all lying in a continuous line in the northern tier of counties. The total yield of the seven was 31,470,164 bushels. Reno and Sumner led in acreage (238,018, and 237,781 respectively), but their per-acre yield cut the product down.

In one of the earliest reports of the State Agricultural Board[30] the per-acre yield of corn in Kansas is compared with that of seven other states, the result being that Kansas showed a per-acre average of 36.3 bushels for the period 1862-1873 as against 33 for the other states. But the states taken were Mass., N. Y., Pa., O., Ind., Ill., and Mo., - all older states, whose ground had been under the plow for a great length of time compared to Kansas' land. It was the boast of a young state. Looking backward now, after a half-century of soil robbery, over the list of yearly averages the situation seems different. The average yield for the United States for corn in 1910 was 27.4 bushels, for Kansas 19.[31] For the last twenty-five years, 1886-1910, an average of 21.75 has obtained in Kansas, as opposed to 35.76 for the twenty-four years 1862-1885. Although the fact must not be overlooked that this decrease is due in part to the added acreage in the western and less productive part of the state, nevertheless a large part of it remains to be explained only by an im-

poverished soil in the eastern part, as figures for counties so located show. The annual acreage, yield, value, and average yield per acre, 1860-1910, follow, in millions.

Year	Acres	Bushels	Value	Av. yield per acre, bu.
1860	- - -	5.67	- -	- - -
1861	- - -	6.24	- -	- - -
1862	.17	6.81	$2.18	40.00
1863	.19	8.51	2.55	44.00
1864	.18	4.67	6.40	25.00
1865	.16	6.72	3.56	41.00
1866	.19	6.52	4.11	34.20
1867	.21	8.15	4.48	38.60
1868	.36	6.48	6.42	18.00
1869	.50	24.50	10.78	48.00
1870	.50	16.68	9.67	33.00
1871	.61	24.69	7.16	40.00
1872	.76	29.63	6.51	38.50
1873	1.20	47.00	14.57	39.10
1874	1.52	15.69	12.06	10.25
1875	1.93	80.79	19.07	48.80
1876	1.84	82.30	19.21	43.68
1877	2.56	103.49	20.20	40.38
1878	2.40	89.32	17.01	37.13
1879	2.99	108.70	26.56	36.29
1880	3.55	101.42	24.92	28.53
1881	4.17	80.76	44.85	19.33
1882	4.44	157.00	51.83	35.36
1883	4.65	182.08	47.49	39.14
1884	4.54	190.87	39.51	41.99
1885	5.26	177.35	40.42	33.67
1886	5.80	139.56	37.96	24.05
1887	6.53	75.79	26.83	11.60
1888	6.99	168.754	52.39	24.13
1889	6.82	273.88	51.64	40.15
1890	5.75	51.09	21.49	8.84
1891	5.20	139.36	48.05	26.75
1892	5.60	138.65	42.08	27.74
1893	6.17	118.62	32.62	19.20
1894	6.40	66.95	25.35	10.45

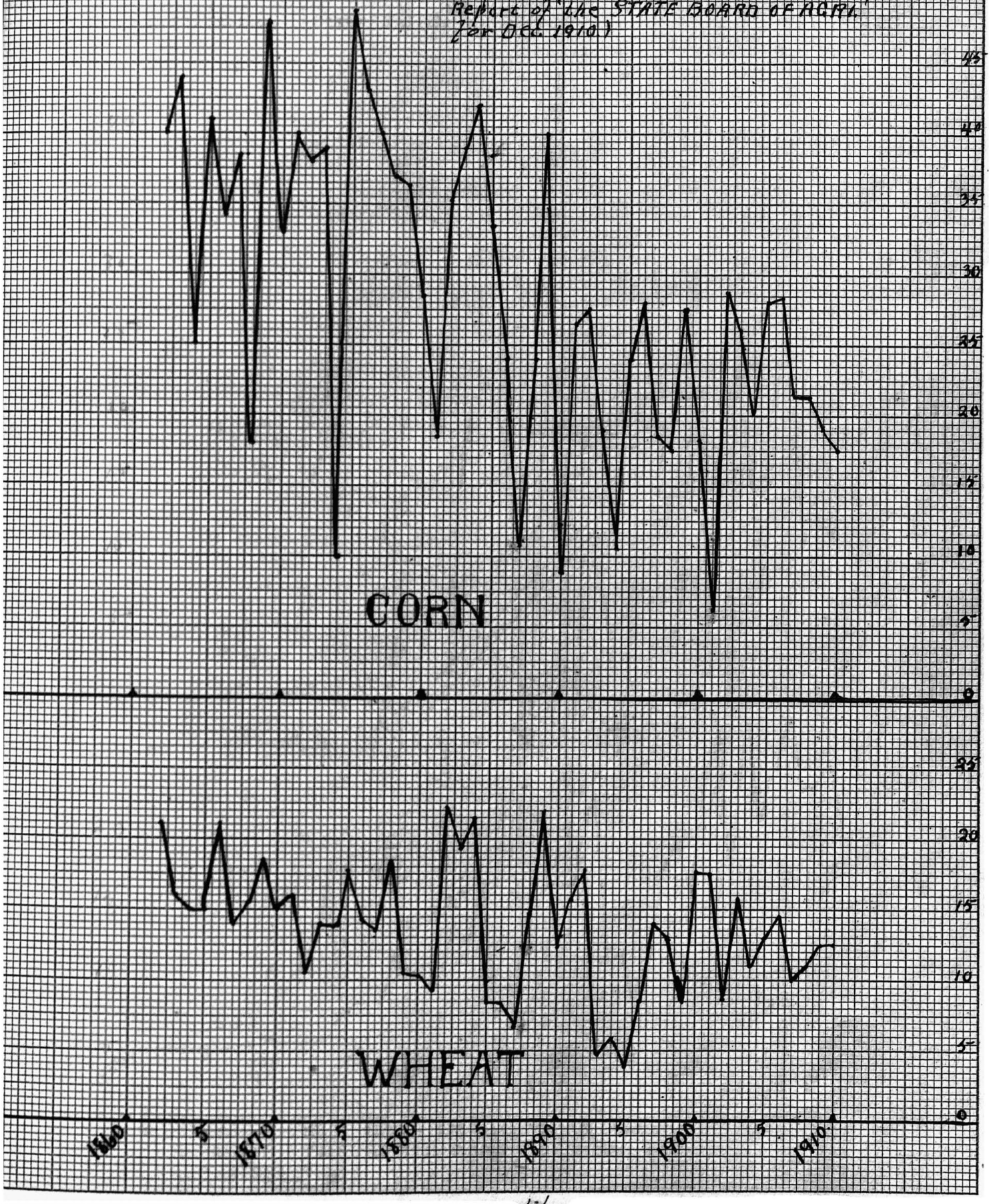
(Year	Acres	Bushels	Value	Av. yield per acre.)
1895	8.39	201.45	$ 46.18	24.00
1896	7.89	221.41	35.63	28.03
1897	8.29	152.14	28.55	18.34
1898	7.23	126.99	30.29	17.54
1899	8.19	225.18	53.53	27.48
1900	7.36	134.52	39.58	18.25
1901	6.72	42.60	21.73	6.33
1902	6.99	201.36	78.32	28.80
1903	6.52	169.35	57.07	25.95
1904	6.49	132.02	50.71	20.33
1905	6.79	190.51	68.71	28.01
1906	6.58	187.02	65.11	28.40
1907	6.80	145.28	63.04	21.33
1908	7.05	150.64	82.64	21.34
1909	7.71	147.00	83.06	19.06
1910	8.58	152.81	76.40	17.79

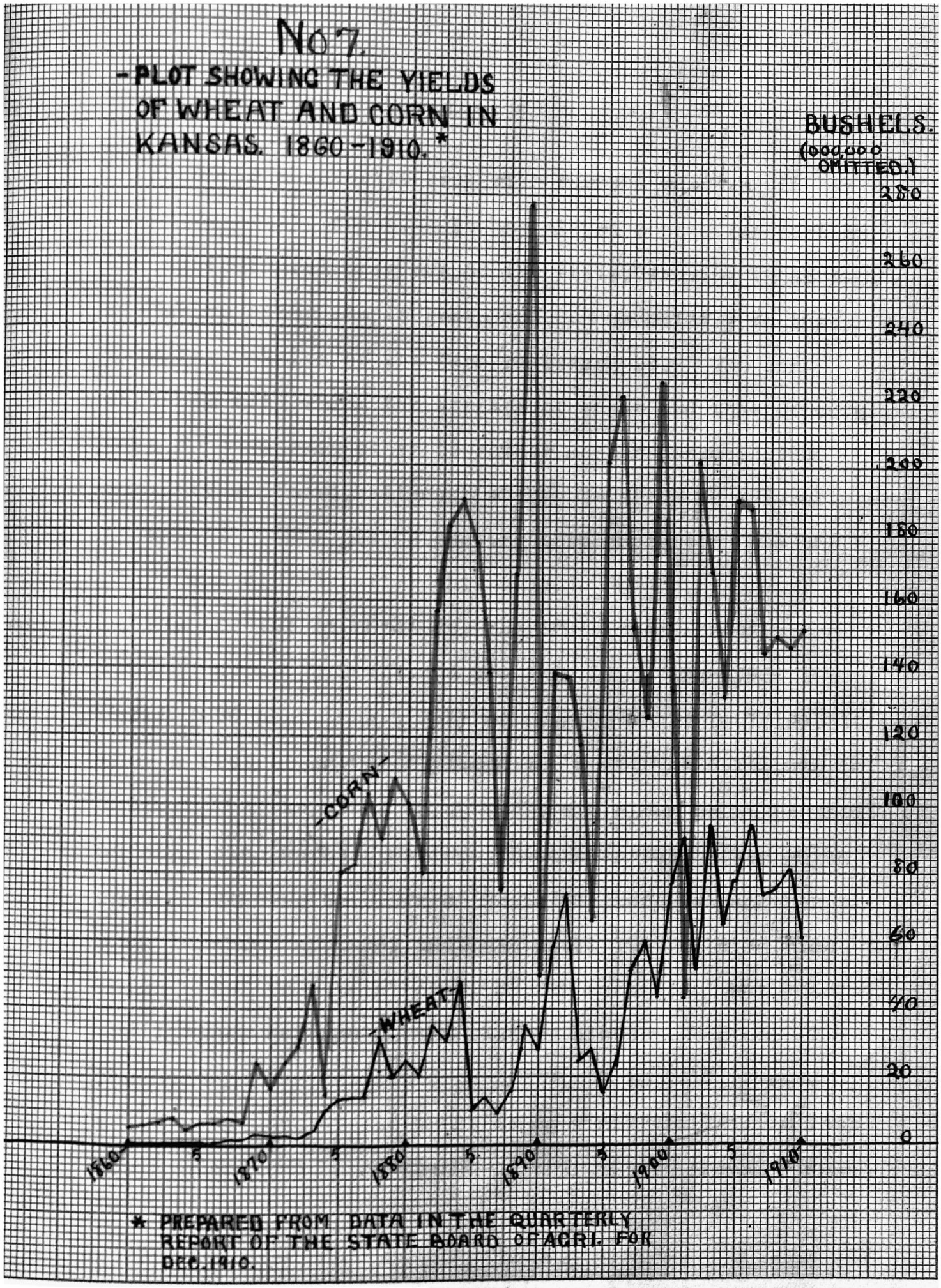
(The above table is to be found on page 13, of the report of the Kansas State Board of Agriculture, for the quarter ending December 1910.)

(See the two charts following this page for the graphs of the average yield per acre of corn, and for the total yield of corn for the different years.)

No. 6.

– Chart showing the average yield per acre of wheat and corn in Kansas, 1860–1910. (Prepared from data in the Quarterly Report of the STATE BOARD OF AGRI. for Dec. 1910.)



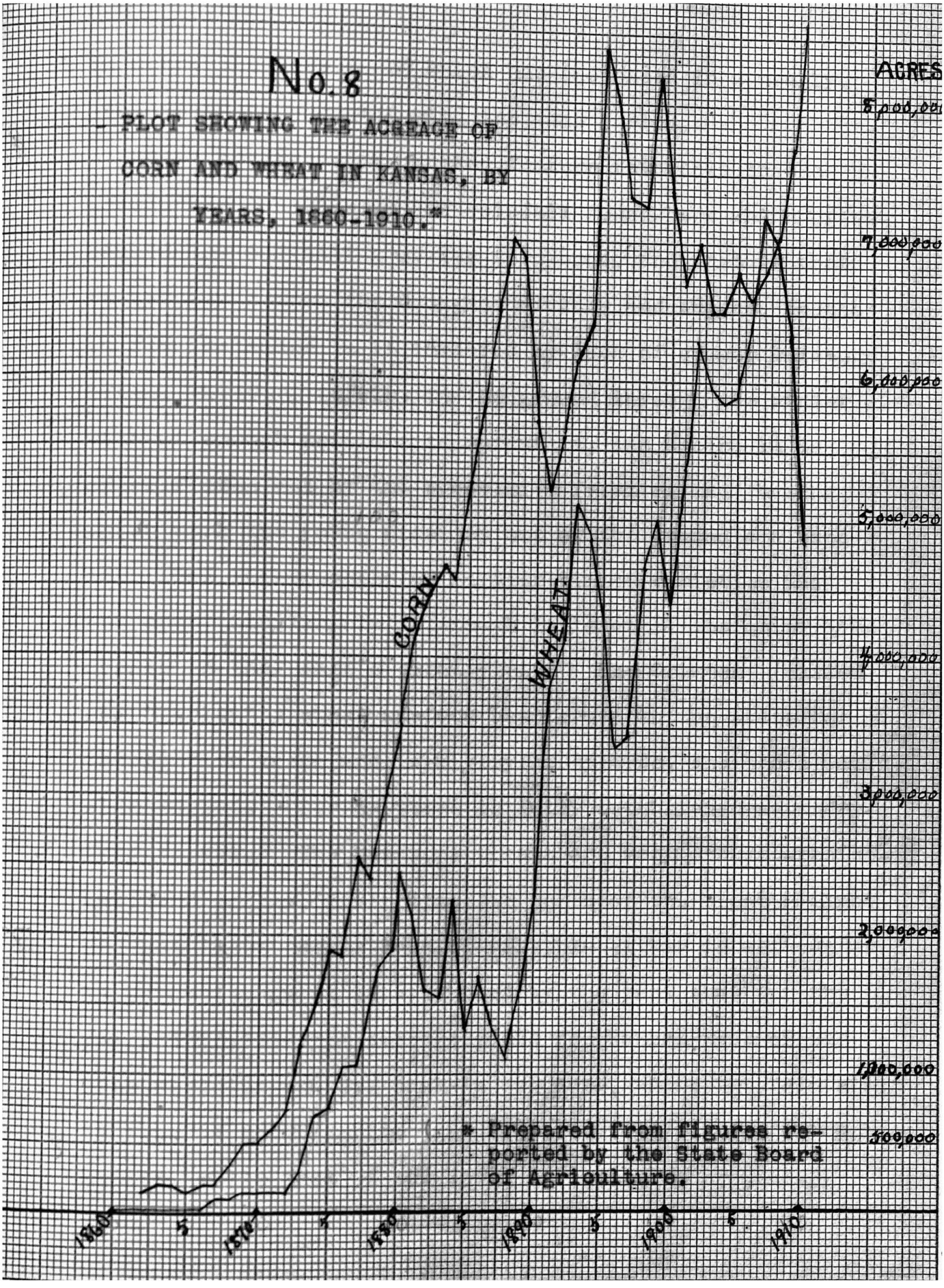

No 7.
-PLOT SHOWING THE YIELDS OF WHEAT AND CORN IN KANSAS. 1860-1910.*
BUSHELS. (000,000 OMITTED.)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
CORN
WHEAT
1860
5
1870
5
1880
5
1890
5
1900
5
1910
* PREPARED FROM DATA IN THE QUARTERLY REPORT OF THE STATE BOARD OF AGRI. FOR DEC. 1910.

5-7.

WHEAT.

Wheat is a favorite crop with farmers wherever it can be successfully grown. It has played a peculiar part in the agricultural progress of the state, varying in acreage as no other staple grain has, - due chiefly to the changing opinion of the farmers toward it.[32] The consistency with which the acreage of wheat and that of corn have opposed each other is rather more remarkable than commonly supposed, although such a relation is naturally seen to exist. (For graphs showing this opposition see the chart immediately after this page.)

The acreage of wheat for the '70's rose steadily from 156,200 acres to 2,444,434 acres in 1880, then from 1880 until 1888 there was a fall of over one-half to 1,120,119 acres, when a rise began which placed the number at 5,110,873 in 1893. The year 1888 which marks a minimum point in wheat acreage also marks a maximum in corn acreage after which comes a depression. From '93 to '96 there was another drop in wheat acreage, and then until 1907 a third rise which ended in a total of 7,235,283 acres for that year, the largest acreage in the state's history. Since 1907 the acreage has decreased to 4,870,450 in 1910, caused chiefly by much of the wheat being winter-killed the last few winters and being disked up and and the ground planted


No. 8
PLOT SHOWING THE ACREAGE OF CORN AND WHEAT IN KANSAS, BY YEARS, 1860-1910.*
ACRES
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
500,000
CORN
WHEAT
1860
1870
1880
1890
1900
1910
* Prepared from figures reported by the State Board of Agriculture.

in corn, the acreage of which has increased in a nearly proportionate amount during the same period.

Wheat possesses one marked feature favorable to the seasonable distribution of rainfall found here which often causes the curtailing of the corn crop, and that is that it matures before the droughts of July and August, so that in few instances is it hampered by lack of summer moisture. Often, however, it lies in the ground through the winter without enough moisture to sprout it, and again, it is often frozen out by the successive freezing and thawing which work the young plant up out of the ground and expose it. The introduction of hardier winter varieties has overcome this largely, although it is still the chief hindrance to the state's wheat yield. The Crimean, (called red "Turkey") wheat has now been grown in the state for thirty-five years and is a very hardy type, and has a world-wide market. Durham wheat is fully established as a dry-land cereal. The Macaroni wheats are very drought-resistant, and so have their place in parts of the Great Plains.

That improvement is still possible either in methods or in varieties grown is evidenced by the fact that for the years 1895-1899 the average yield for Kansas west of the 99th meridian was 6.7 bushels per acre, where the rainfall is from 16 to 25 inches annually, coming in the growing season, while that of the lower Volga region of eastern

Russia, with a rainfall of 12 inches and a characteristically adverse climate, extreme in heat, cold, and drouth, was 7.7 for the same period.[33]

Russia would be a hard competitor with Kansas were it not for the advantage which the Kansas farmer enjoys in the way of improved machinery, and knowledge of the business which enables him to produce a grain free from dirt and weed seed.[34] As it is our hard wheat has begun to show a deterioration in flour qualities because of the wornout soil, and more care should be given to maintaining its gluten-producing qualities.

For the period of years 1862-1884 inclusive, the average annual average yield per acre for Kansas was 15.84 bu.; for the succeeding period 1885-1910 it was 11.91, a considerable decrease, as was the case with corn. The average per-acre yield for the United States for the past ten years has been 14.1 bushels.[35] Although Kansas ranked first in the production of wheat in 1899, according to the Twelfth Census, she ranked thirty-seventh among the states in yield per acre. This year, however, was not typical, since for the following two years the average yield was double that of this year, according to the state reports.[36] The crop of 1899 suffered from winter-killing and hot winds. In 1902 the average per-acre yield of the United States

was 14.5; Germany 23.5; and England 31.9.[37] Such yields, though, are not to be expected of Kansas now. At first we had a high yield when the land was new, then the yield fell as the fertility decreased; we are now at the turning point, or a little past it, after which larger yields will be secured, through improved cultivation, growing eventually, and in not more than a quarter-century either, to an average larger than that first obtained. We have been passing through a period similiar to the early days of a railway, when it is neither expedient nor desirable that the most capital and equipment be applied. More labor, cheaper capital, and less available land are making the application of more labor and capital to the land profitable, where before a less amount was the more profitable way of combining the factors.

The early settlers of the state considered the uplands unfitted for wheat, especially in that part of the state west of the 98th meridian, the arbitrary border of the Great Plains. Remembering the immense wheat yields of the state and the fact that the Great Plains portion of it was regarded as part of the fabulous "Great American Desert", the movement shown by the following set of charts is interesting and illuminating. The data for the charts were collected from the reports of the State Board, and one of

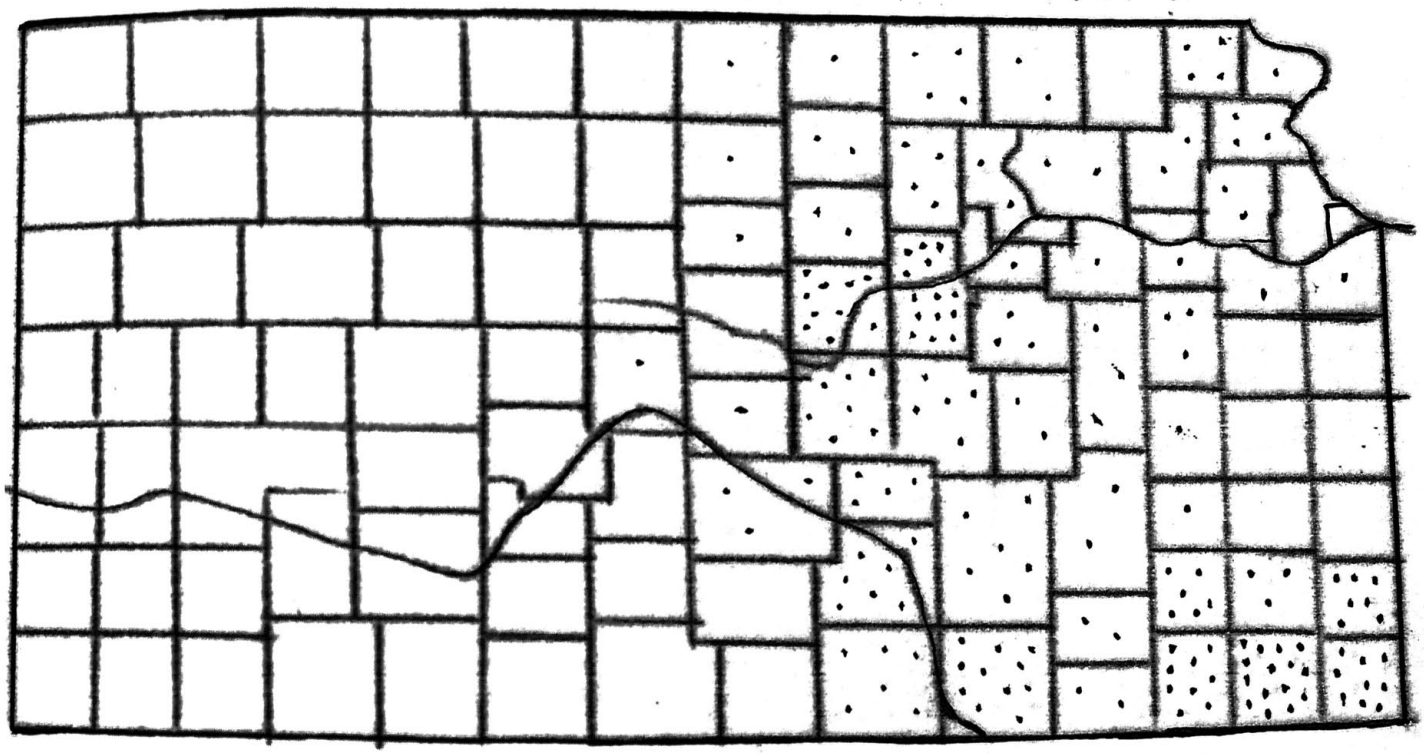
the maps shows at a glance what the list of counties and their yields could not very well convey, that is, the location of the shifting wheat belt of the state, which, in the series of maps, moves westward into the Great Plains area. The maps date from 1875 to 1910, and represent the wheat belt for every fifth year. Each dot represents 50,000 bushels of winter wheat, and they tell their story better than words. The earlier maps err in the demarcation of some of the counties, but these are in the western part of the state where the error does not affect the dots. The years 1885 and 1895 were years of light yield, this, however, does not hinder the point of the maps which is the location, and not the quantity .

Spring wheat which is omitted would, if inserted, make very little difference in the number of dots, adding, for example, only nine dots for 1910, six in Cheyenne, and three in Sherman county. In 1875 the counties with the largest spring wheat acreage were Marshall, Washington, Jewell, Cloud, and Clay. In 1885 those of largest acreage were Phillips, Norton, Smith, Marshall, Brown, and Jewell, - which shows a westward tendency, still more noticeable in 1895 when Sherman, Rawlins, Decatur, Cheyenne, and Thomas led. In 1905 these same counties with Gove were still in the lead. Thus the center of production of spring wheat has traveled three-fourths the length of the state

No.9. WHEAT AREA, (WINTER VARIETY.) *

One dot representing 50,000 bushels.

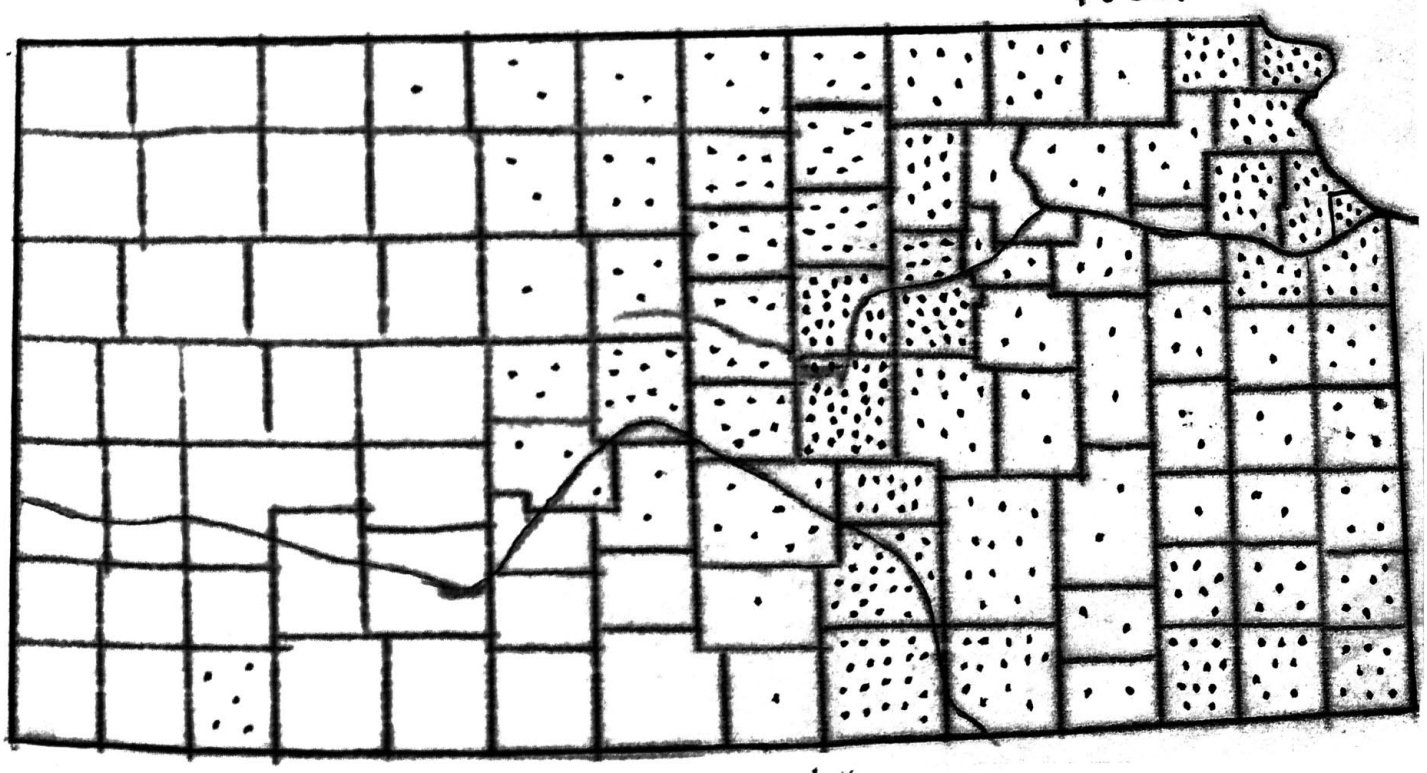
1875.



* This series of maps was prepared from data taken from the reports of the State Board of Agriculture for the years named.

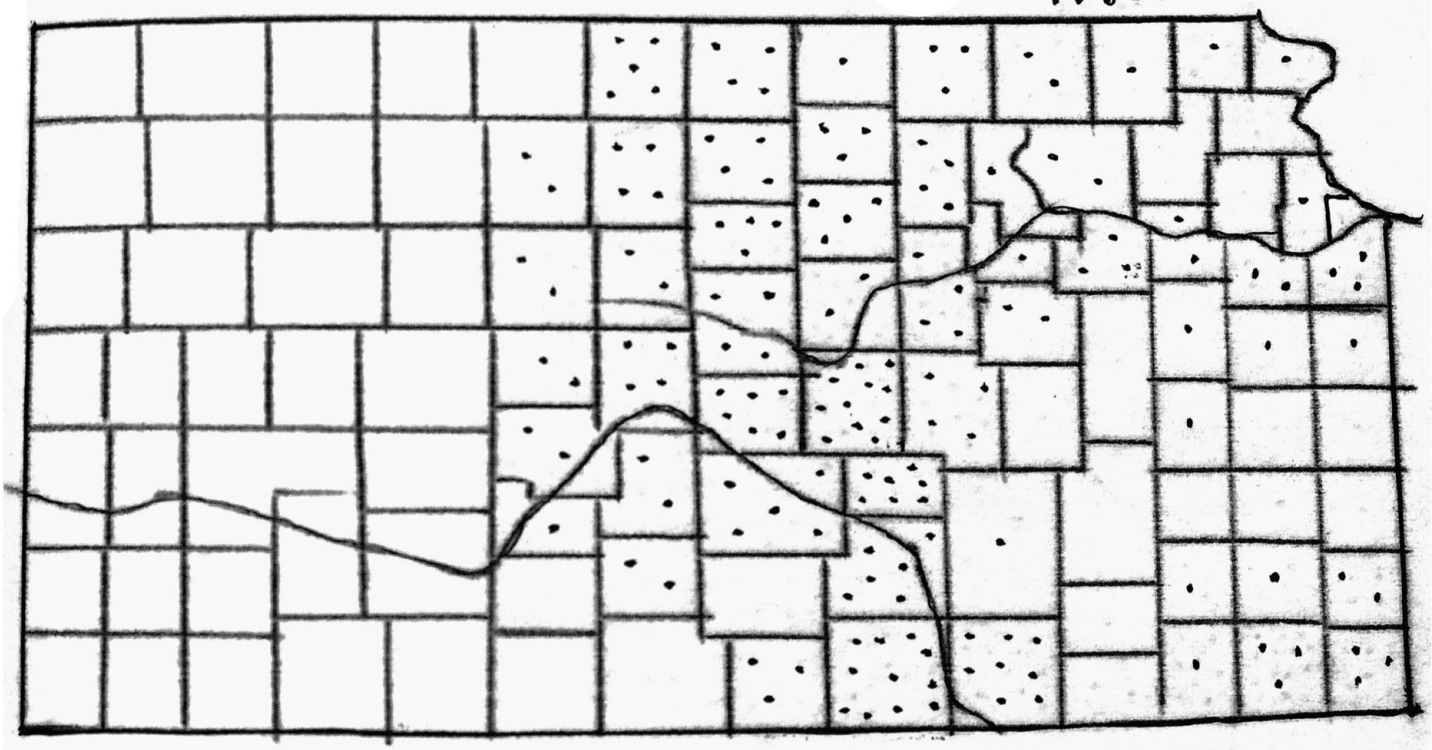
WHEAT AREA, (CONT.)

1880.



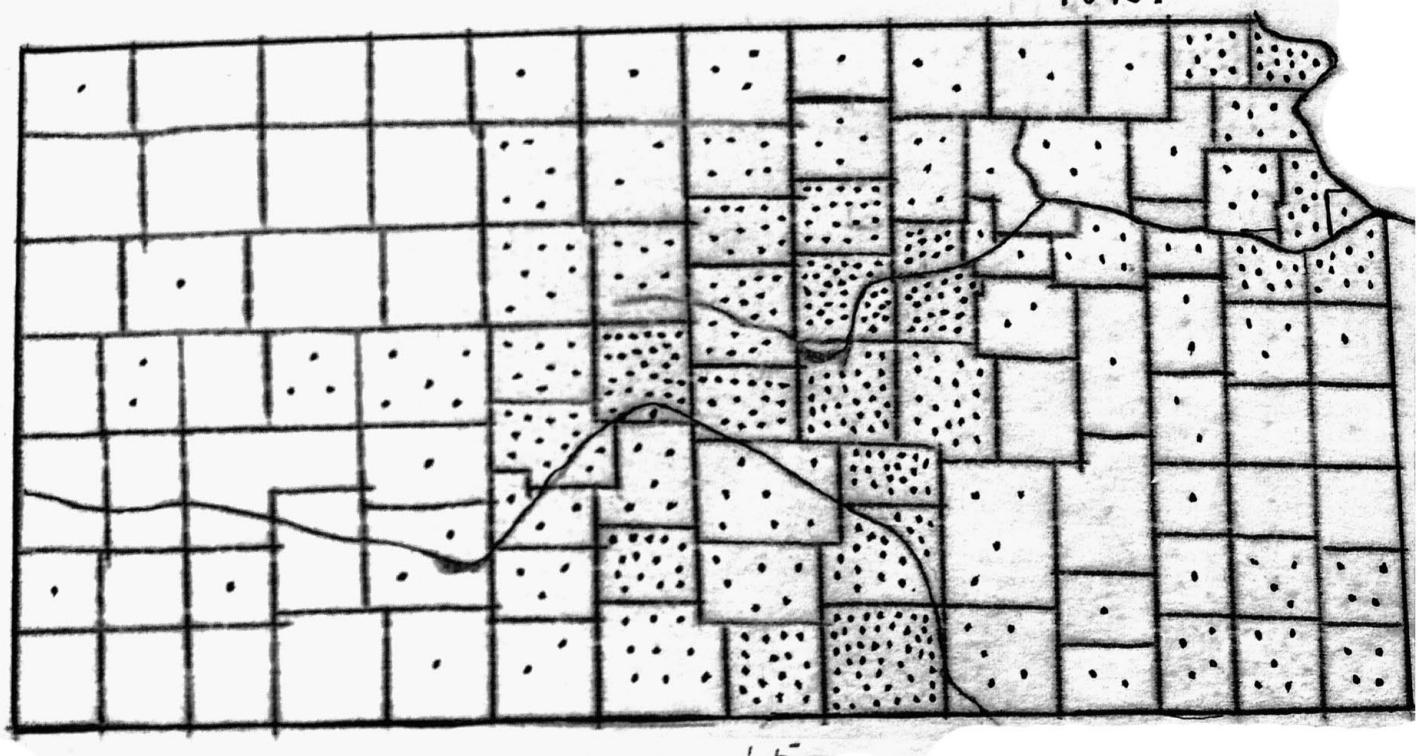
WHEAT AREA (CONT.)

1885.



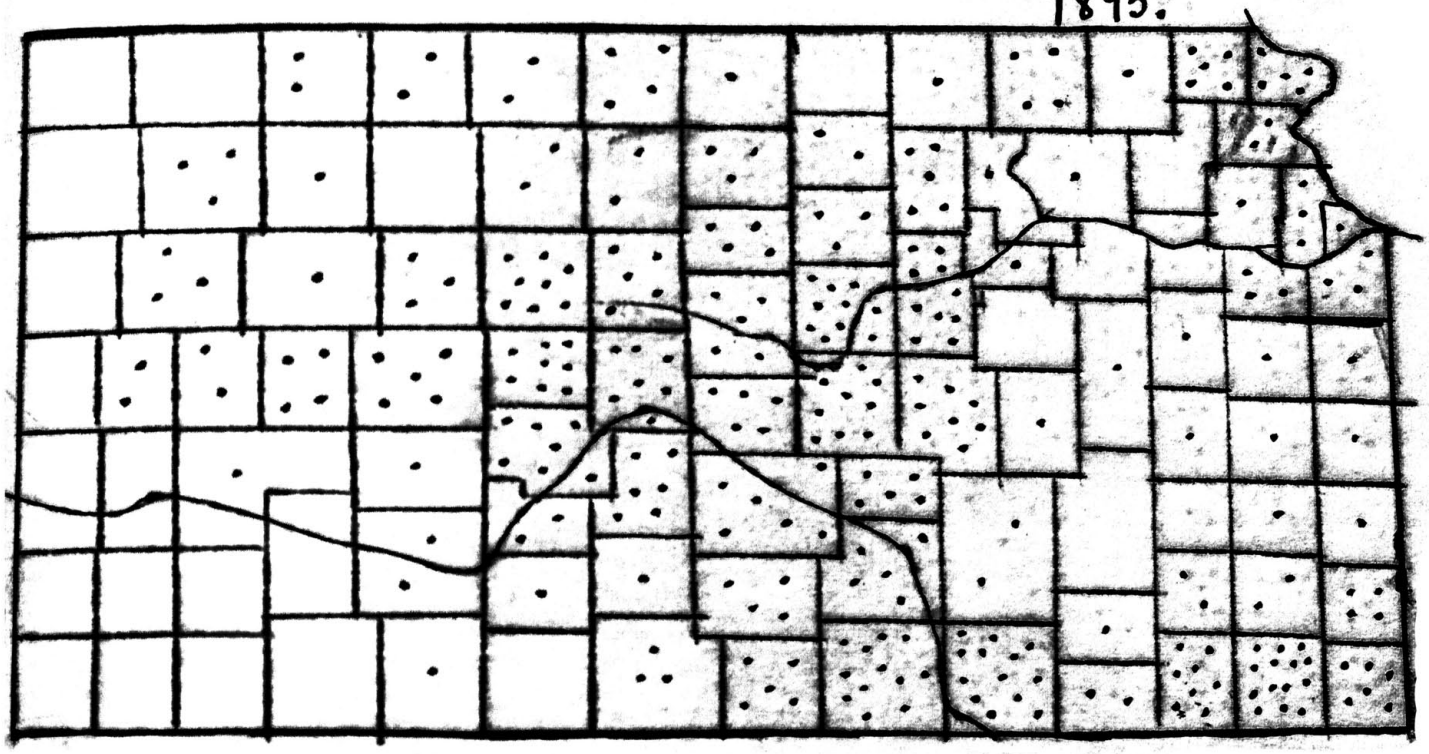
WHEAT AREA (CONT.)

1890.



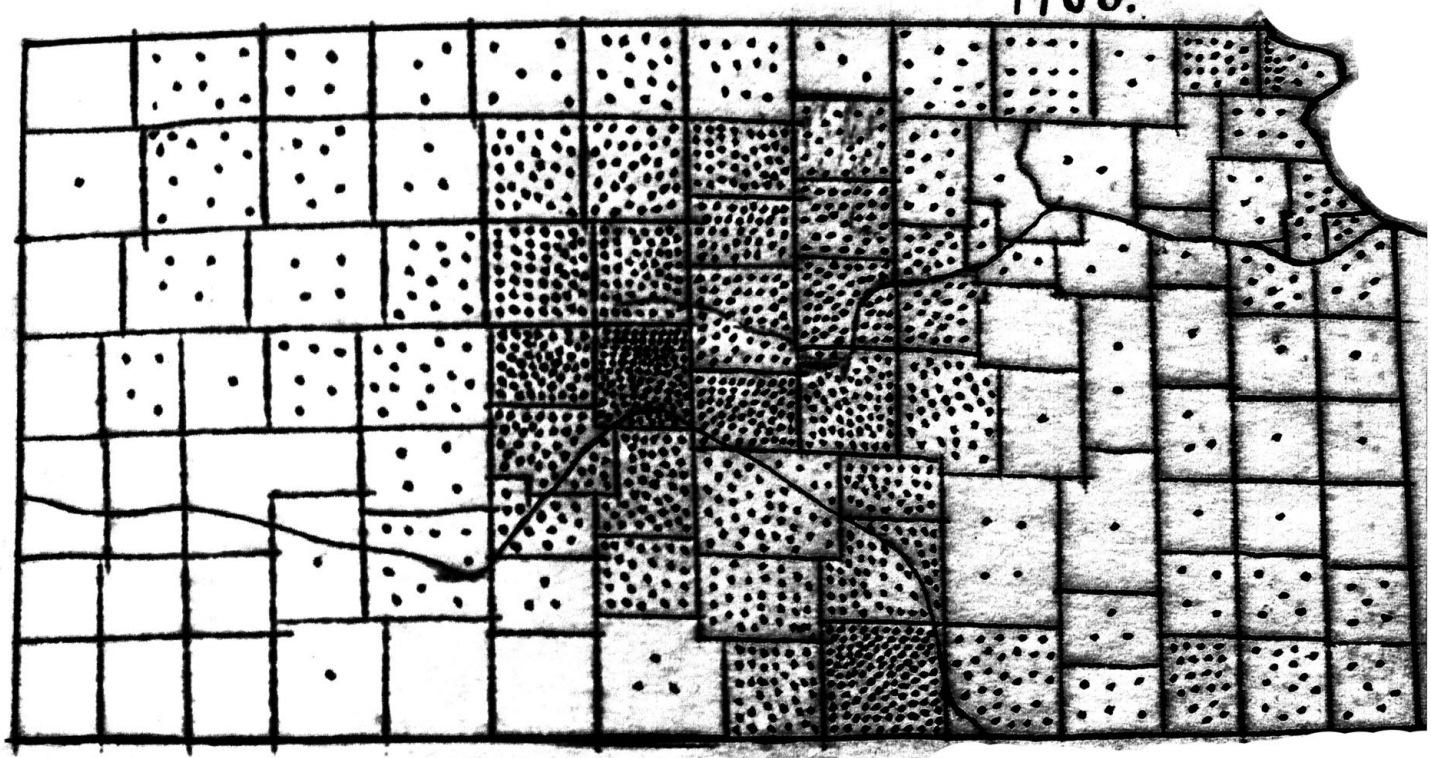
WHEAT AREA (cont.)

1895.



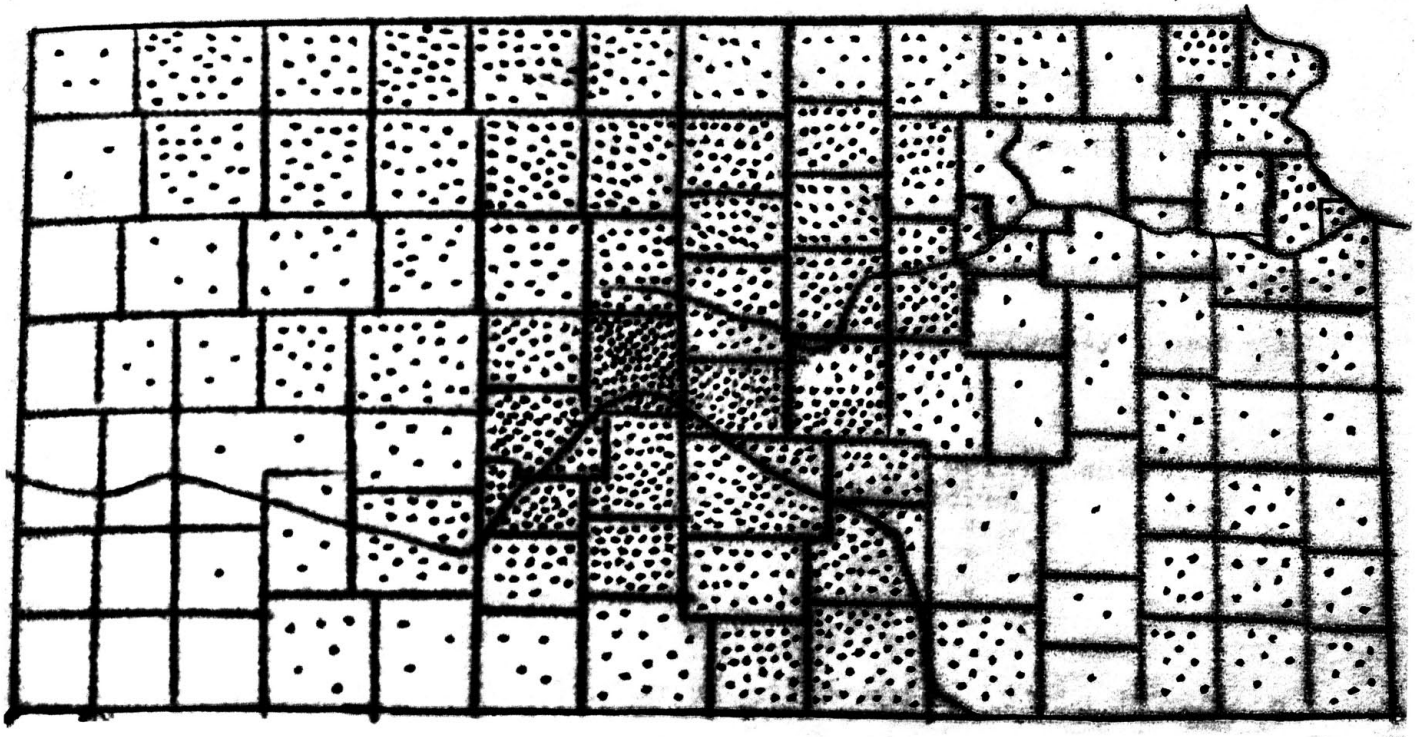
WHEAT AREA, (cont.)

1900.



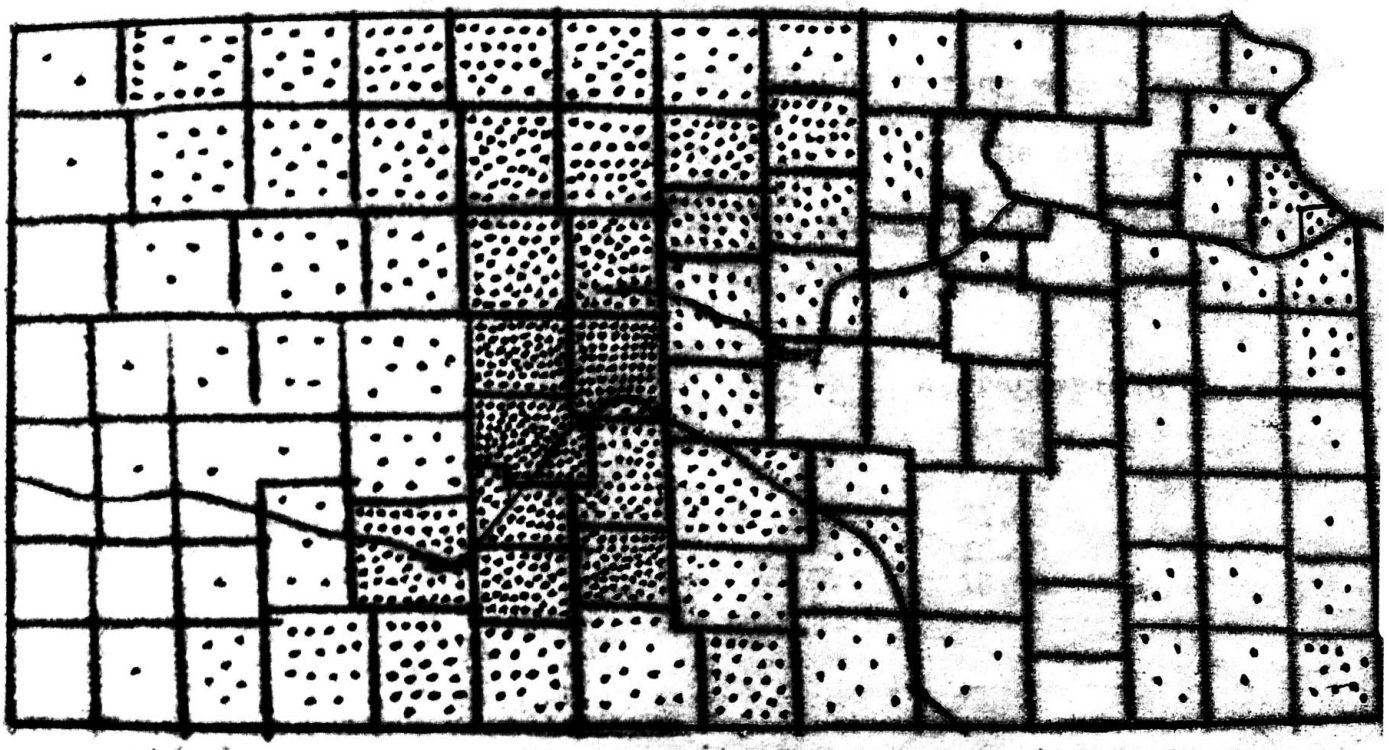
WHEAT AREA (CONT.)

1905.



WHEAT AREA (CONT.)

1910.



and now rests in the extreme north-western corner. The returns for 1910 show the area to be massed more than ever in the corner, Cheyenne, the corner county, producing 288, 785 bushels out of a total of only 734,755 for the state. In 1909 Cheyenne produced 357,520 out of a total of 732,036. The acreage of spring wheat has decreased greatly since 1875, running thus:

Year	Acres of spring wheat.
1875	237,523 acres
1885	90,826 " ,
1895	115,457 " ,
1905	90,101 " ,
1910	99,891 " .

Marshall and Washington counties which led in 1875 with 27,000 and 25,000 respectively, reported 890 and 46 in 1910. This variety with an average yield of only about two-thirds that of winter wheat in the state can not exist long in competition where winter wheat can be grown, and has ceased to play much of a part. (For example of the yields, for 1874-1884 winter wheat averaged 16.08; spring wheat 11.15 bushels per acre.) The table below gives the acreage, annual product, value, and average yield of wheat, winter and summer, in Kansas , 1860-1910, in millions.

Year	Acres	Bushels	Value	Average yield per acre.
1860	- - -	.16	- - -	- - - -
1861	- - -	.18	- - -	- - - -
1862	.009	.20	$ .14	21.00
1863	.016	.26	.23	16.00
1864	.013	.20	.40	15.00

(Year	Acres	Bushels	Value	Av. yield per acre.)
1865	.012	.19	.33	15.00
1866	.012	.26	.49	21.40
1867	.089	1.25	2.30	14.00
1868	.098	1.53	2.07	15.60
1869	.151	2.80	2.21	18.50
1870	.156	2.34	2.01	15.00
1871	.169	2.69	3.04	15.90
1872	.185	2.15	3.06	11.60
1873	.309	4.33	4.33	14.00
1874	.716	9.88	9.88	13.79
1875	.743	13.20	11.35	17.77
1876	1.023	14.62	12.41	14.28
1877	1.063	14.31	12.24	13.45
1878	1.730	32.31	18.44	18.67
1879	1.932	20.55	18.44	10.63
1880	2.444	25.27	20.98	10.34
1881	2.182	20.47	21.70	9.38
1882	1.602	35.73	24.00	22.29
1883	1.559	30.02	22.32	19.25
1884	2.237	48.05	20.51	21.47
1885	1.290	10.77	6.82	8.34
1886	1.758	14.57	8.48	8.29
1887	1.373	9.27	5.75	6.75
1888	1.120	16.72	12.09	14.93
1889	1.594	35.31	19.91	22.15
1890	2.321	28.80	23.41	12.40
1891	3.733	58.55	42.59	15.68
1892	4.129	74.53	40.69	18.05
1893	5.110	24.82	11.03	4.85
1894	4.840	28.20	11.29	5.82
1895	4.171	16.00	7.46	3.84
1896	3.357	27.75	13.25	8.27
1897	3.444	51.02	34.38	14.81
1898	4.624	60.79	32.93	13.14
1899	4.988	43.68	22.40	8.76
1900	4.378	77.33	41.97	17.66
1901	5.316	90.33	50.61	16.99
1902	6.301	54.64	29.13	8.67
1903	5.964	94.04	52.42	15.76
1904	5.861	65.14	51.40	11.11
1905	5.925	77.17	53.88	13.02
1906	6.436	93.29	55.17	14.49
1907	7.235	74.15	56.78	10.24
1908	6.939	76.80	63.88	11.06
1909	6.150	80.95	75.94	12.55
1910	4.870	61.01	52.78	12.53

(This table is given on page 12, of the quarterly report of the Ks. State Board of Agri. Dec. 1910.)

(See chart No. 6 for graph of the average yield of wheat per acre, and No. 7 for the total yield of wheat, 1860-1910.)

OATS.

The acreage devoted to this crop showed a steady growth with but few exceptions from a report of 2,939 acres in 1862 to 1,758,127 in 1893, since which it has fluctuated widely, falling to 831,159 in 1908 and standing at 1,707,312 in 1910. IN 1870 of the cultivated area of the state 8.6% was in oats, in'80 5.3, in '90 7.7, in 1900 4.5, in 1910 5.1. The largest crop ever produced was in 1888 (54,665,055 bushels); the second largest and the most valuable was the crop of 1910 (53,993,474 bushels, valued at $18,441,607.62)

The average yield per acre from 1862 to 1885 was 33.8 bushels, from 1886 to 1910 it was 23.8, exhibiting a tendency similiar to that observed in the case of corn and wheat.

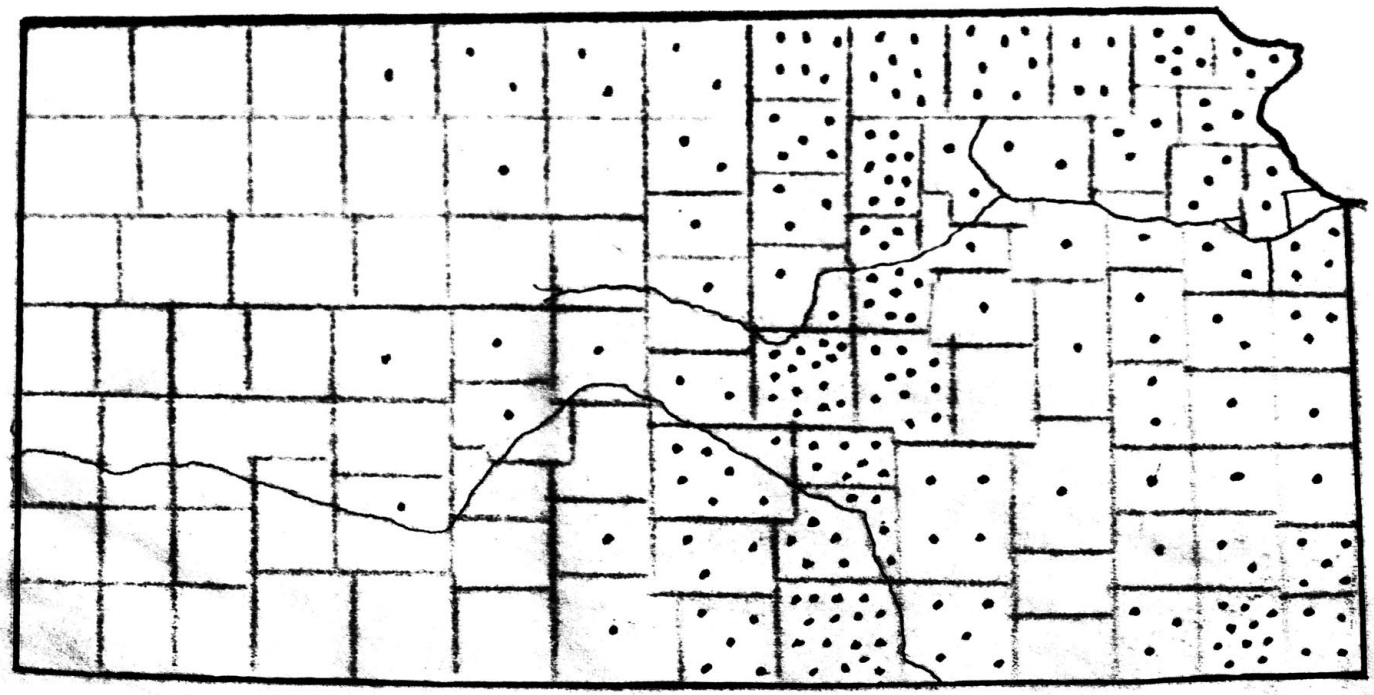
The location of the oat belt corresponds more closely with the corn belt than with the wheat belt, as will appear from a comparison of the following map with the ones showing the wheat and corn distribution. (Charts No. 5 and 9.)

The main oat district will be seen to lie in a line north and south from Republic and Washington counties down through the state to Sumner county. While oats are grown in every county their center of production is about one hun-

No. 10

DISTRIBUTION OF OATS, 1910,

One dot representing 200,000 bushels.



From data in quar. rep. S.B.A. Dec. 1910

dred miles east of that of wheat.

The product of oats by five-year periods since 1866 is as follows: 38

1866-70 - - - - - - - -	5,871,316	bushels,
1871-75 - - - - - - - -	36,994,637	" ,
1876-80 - - - - - - - -	67,376,610	" ,
1881-85 - - - - - - - -	123,483,700	" ,
1886-90 - - - - - - - -	214,383,929	" ,
1891-95 - - - - - - - -	161,871,861	" ,
1896-1900 - - - - -	121,665,337	" ,
1901-05 - - - - - -	133,580,416	" ,
1906-10 - - - - - -	136,954,786	" .

TAME HAY

It is only within recent years that tame hays have become of importance . The abundance of prairie hay at first made the sowing of tame hays needless, and it was not until the prairie sod, needed more for other crops, was broken up and the yield of wild hay curtailed that there came an appreciable growth in the yield of tame hay.

In 1889 2,456,984 tons of prairie, and 395,967 tons of tame hay were cut; in 1909 1,497,793 tons of prairie, and 2,052,927 tons of tame hay were put up. Thus the two

hold a sort of a reciprocal relation to each other, the tame replacing the wild. In 1904 the yield of tame exceeded the wild and since then has kept the lead.

Acres of tame hay in the state. [39]

1875	1875	1885	1895	1905	1910
Timothy	21,218	286,846	464,646	562,084	420,267
Clover	16,714	113,003	87,089	124,758	179,441
Blue GVS	31,626	63,132	160,663	370,184	212,882
Alfalfa	- -	- -	139,878	602,560	926,492
Orchard	- -	17,628	3,010	5,771	4,295
Others	- -	- -	43,667	80,167	73,074
Total	69,558	462,981	898,953	1,745,524	1,816,451

Most of the increase is due to the phenominal growth of alfalfa which now occupies over one-hald of the acreage devoted to tame hays. Timothy, the next important, shows a decrease in the past few years.

ALFALFA (Medicago sativa)

Alfalfa is chiefest of the tame hays of the state. Although a new factor in the agricultural system of the United States it is probably the oldest plant of which we have record,[40] and has been on this continent for about three-

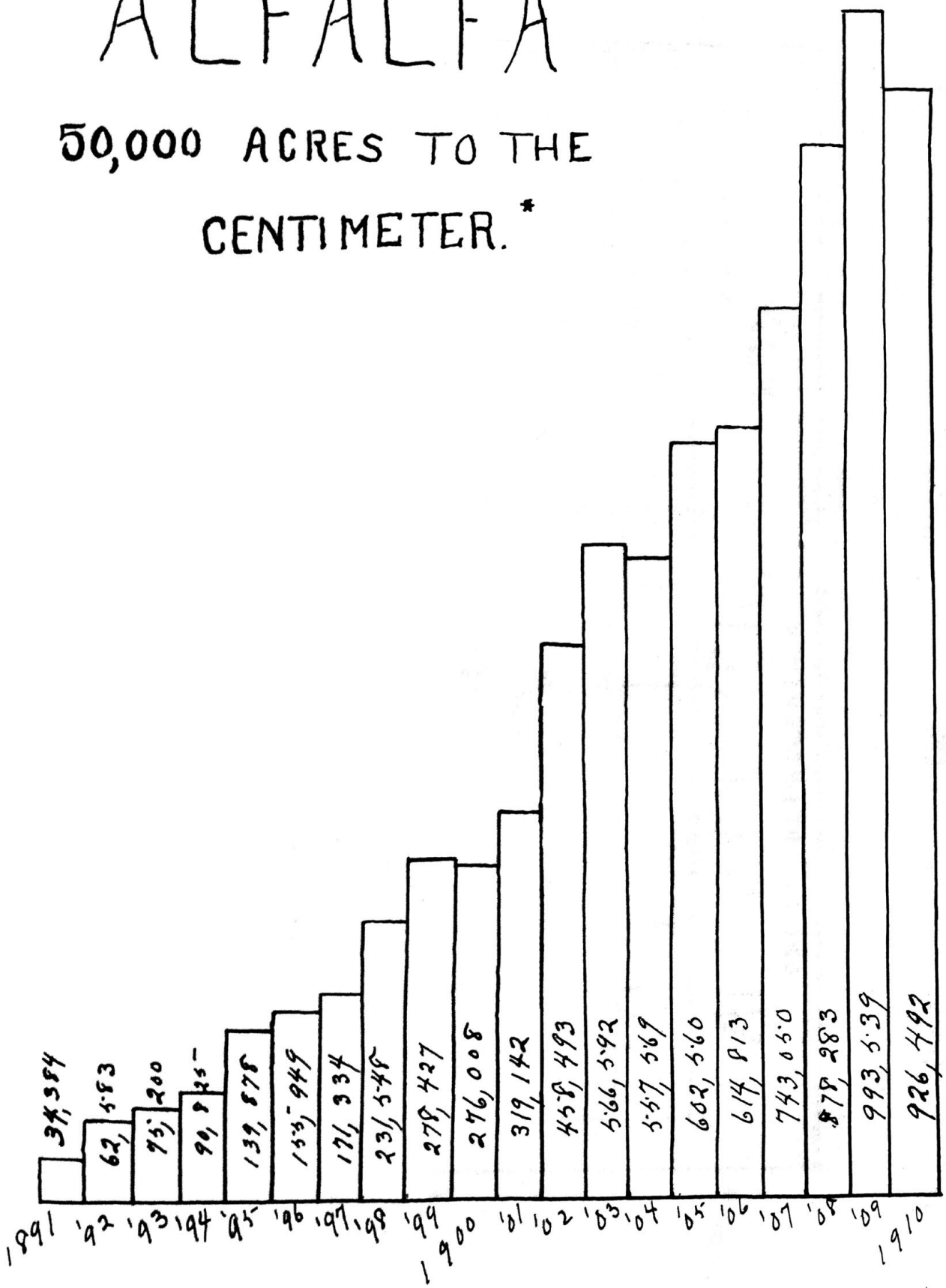
fourths of a century. It first assumed agricultural importance in our country in California, whence it has spread eastward beyond the Mississippi river. It is only of late years that its soil-renewing and forage properties have been appreciated. Being a Leguminosae nitrogen is left in its extended root system. These roots have a wonderful penetration and length. Prof. W.P.Headden, pf Colorado found roots 9 feet long on 9 months old alfalfa. Another reports roots 17 inches long on alfalfa 4 weeks old.[41] These roots are thus able to go deep for their moisture and so fit the plant for this climate. Water standing on the field forty-eight hours will kill the plants. Upon plowing up a field of it the rotting roots leave not only their store of nitrogen but also a vein-labyrinth throughout the soil into which the air and rain can penetrate. From two to five cuttings are made in Kansas each year. Alfalfa requires 15 inches of rain in the Dakotas, 18 inches in Nebraska, and 20 inches in Texas.[42]

(The acreage since 1891, when first reported separately, and a graphical representation of this is given on the following chart. On the second chart is seen the territorial location of the crop of 1910.)

NO. 11.

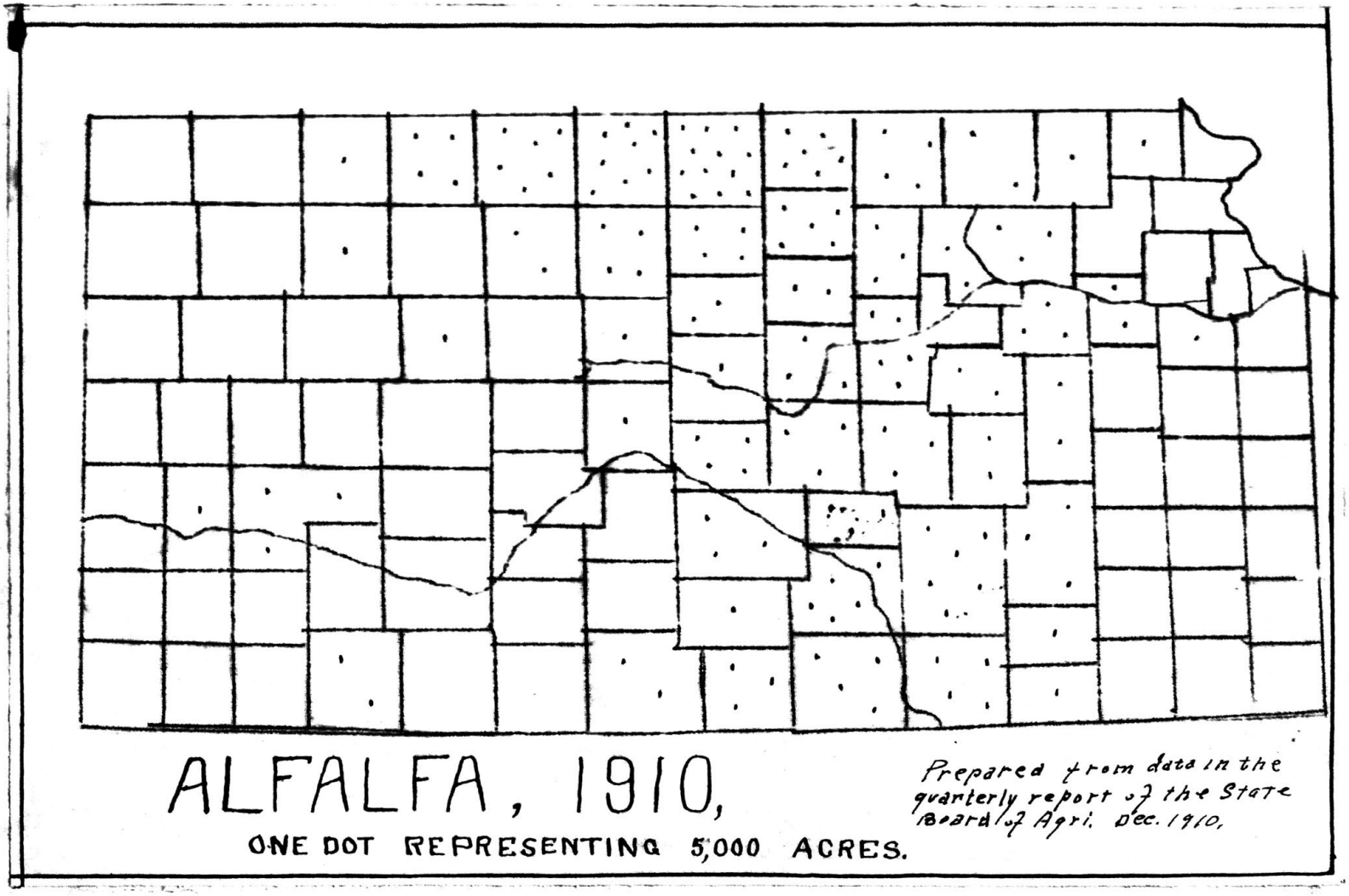
ALFALFA

50,000 ACRES TO THE CENTIMETER.*



* DATA TAKEN FROM REPORTS OF THE STATE BOARD OF AGRICULTURE.

NO. 12.


ALFALFA, 1910,
ONE DOT REPRESENTING 5,000 ACRES.
Prepared from data in the quarterly report of the State Board of Agri. Dec. 1910.

PRAIRIE HAY

From the very nature of the case not much advance has been made with prairie hay, except in caring for the crop. The wild grass was the first source of wealth in the region and made the cattle kings of the early days. It sustained the overland trade and was the stronghold of the pioneer settler. But it could retain its hold under the growing occupation of the land only with a weakening grip. More profitable crop began to replace it, at an unnatural pace since the first crops on the sod are the largest. The acreage fenced has continually increased, but since the '80's the area and amount cut has decreased by three-fifths, and, especially in the eastern and central sections of the state, this has been taken from the poorer pieces of land, those unfitted for cultivation. Its very disappearance from the farms, a movement sensibly advancing westward, indicates progress, since in its stead come the more prolific and nutricious crops of cultivation.

FORAGE.

The discovery and development of suitable forage plants which can be raised cheaply and abundantly has been one of the hardest yet most salutary steps which the agriculture of the Great Plains has taken. It bridges the difference between the improvident, costly, insufficient stock-rais-

ing of the '60's and the comfort and thriftiness of the new century. It means full silos, stacks and barns in the fall, and sleek profitable stock in the spring.

In 1900 Kansas had an acreage and production of kafir corn and cane cut green for forage one-third as large as that for all the other states and territories,[43] and exceeded them in in the production of kafir corn both for its grain and as forage.

In the order of their importance the forage plants, (tame hays excluded) are: kafir corn; sorghum; millet and hungarian; milo maize; and Jerusalem corn.

The state produces far more millet and hungarian than any other state. The total acreage for the United States in 1900 was given as 1,743,887, and that for Kansas as 349,906; the yieldfor the United States 2,850,959 tons and for Kansas 670,770.[44]

Combining forage and hay we secure the following table.

Year	U. S.	Kans.	Kansas' rank.
		TONS.	
1850 -	13,838,642 tons -	- - - -	
1860 -	19,083,896 " -	56,232 -	- 26
1870 -	27,316,048 " -	490,289 -	- 18
1880 -	35,150,711 " -	1,601,932 -	- 8
1890 -	66,831,480 " -	4,854,960 -	- 4
1900 -	79,251,946 " -	7,066,671 -	- 1

New York and Iowa exceeded Kansas in 1900 in acreage of the above but fell behind in yield because of the excess of cane and kafir in Kansas, which give heavier yields than hay, the principle item in the other states.

KAFIR CORN.

The state reports first gave kafir corn an individual entry in 1893, the area being 46,911 acres, since which it has increased to 619,808 in 1910. Its growth in Kansas is closely seconded by that in Oklahoma, the two states forming the chief kafir corn region of the country. In the western part of the state the red variety is preferred, it being a little earlier and hardier than the other varieties. Throughout the rest of the state the black-hulled white is more generally seen, and this is the variety adopted by the state experiment station. 45

Kafir corn will grow wherever Indian corn will, in the main, although it does better in a slightly warmer climate. This feature coupled with the fact that it has an extensive root system fits it for Kansas and Oklahoma, and makes it the greatest dry-weather-resisting crop of this section.

The plant may apparently dry up and remain so for a month, and then revive with the next rain. In this respect it surpasses Indian corn as a sure crop for the western part of the state, where irregularity of the summer rains is marked. Although it is admittedly below maize in its food qualities its greater yield counterbalances this. 46 Tests made at the Kansas State Agricultural College for seven years show that kafir corn produced on an average 40.6% more grain and 95.4% more fodder than maize. 47

(The charts following this page show the annual yields of kafir corn 1893-1910 and the territorial distribution of the crop of 1910.)

Saccharine sorghums are widely sown in the state and cut green for forage, the fodder making a cheap and fattening feed for winter use. In 1910 512,621 acres of sorghums were raised for grain and forage.

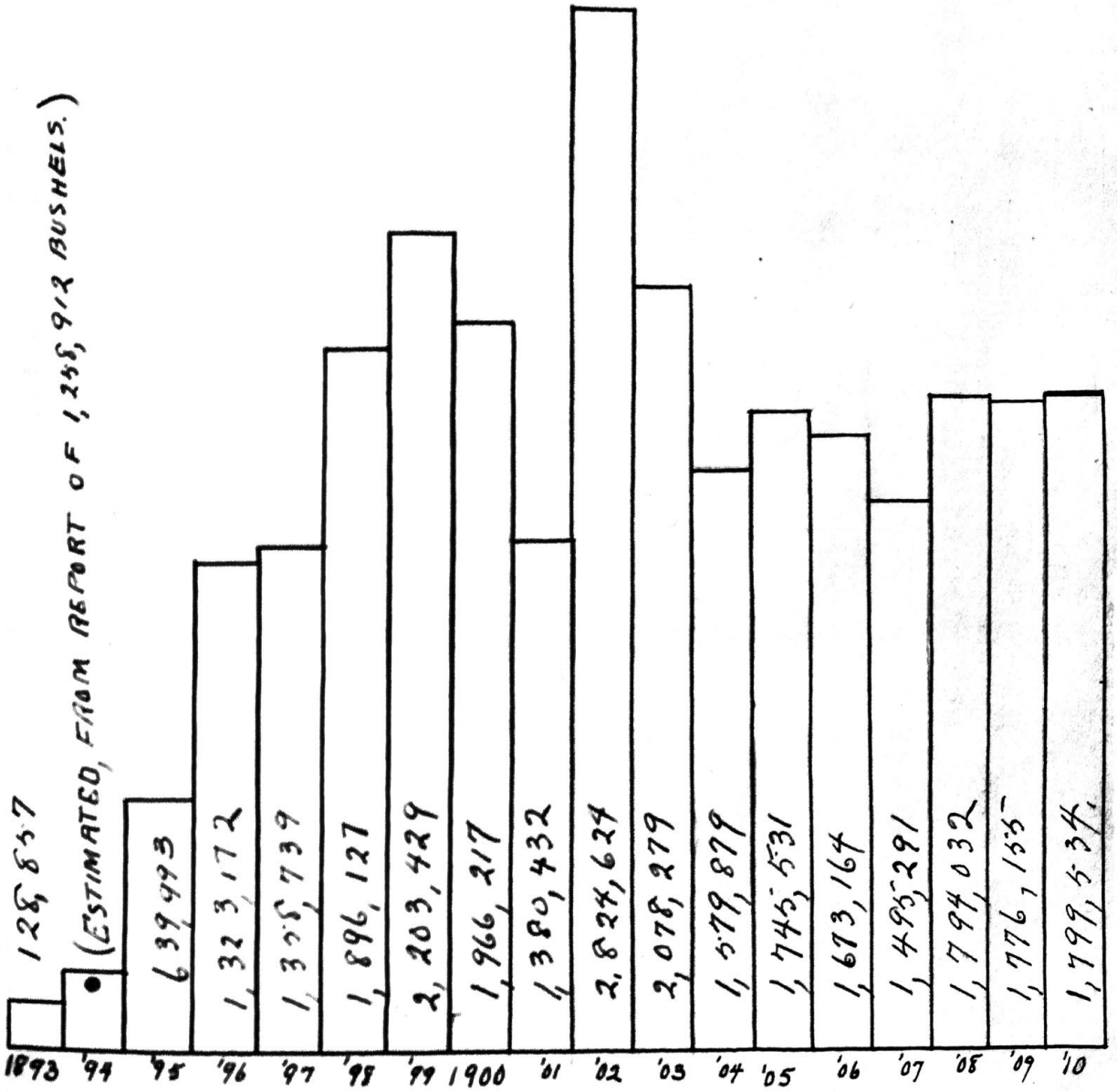
Indian corn is often planted so thickly that it will not properly mature, then cut green, cured, and used as roughage, which is the great item upon which the stock industry of the state depends.

Soy beans, cow-peas, milo maize, rice-corn, and Jerusalem corn have but a relatively small importance in the state.

No. 13.

KAFIR CORN

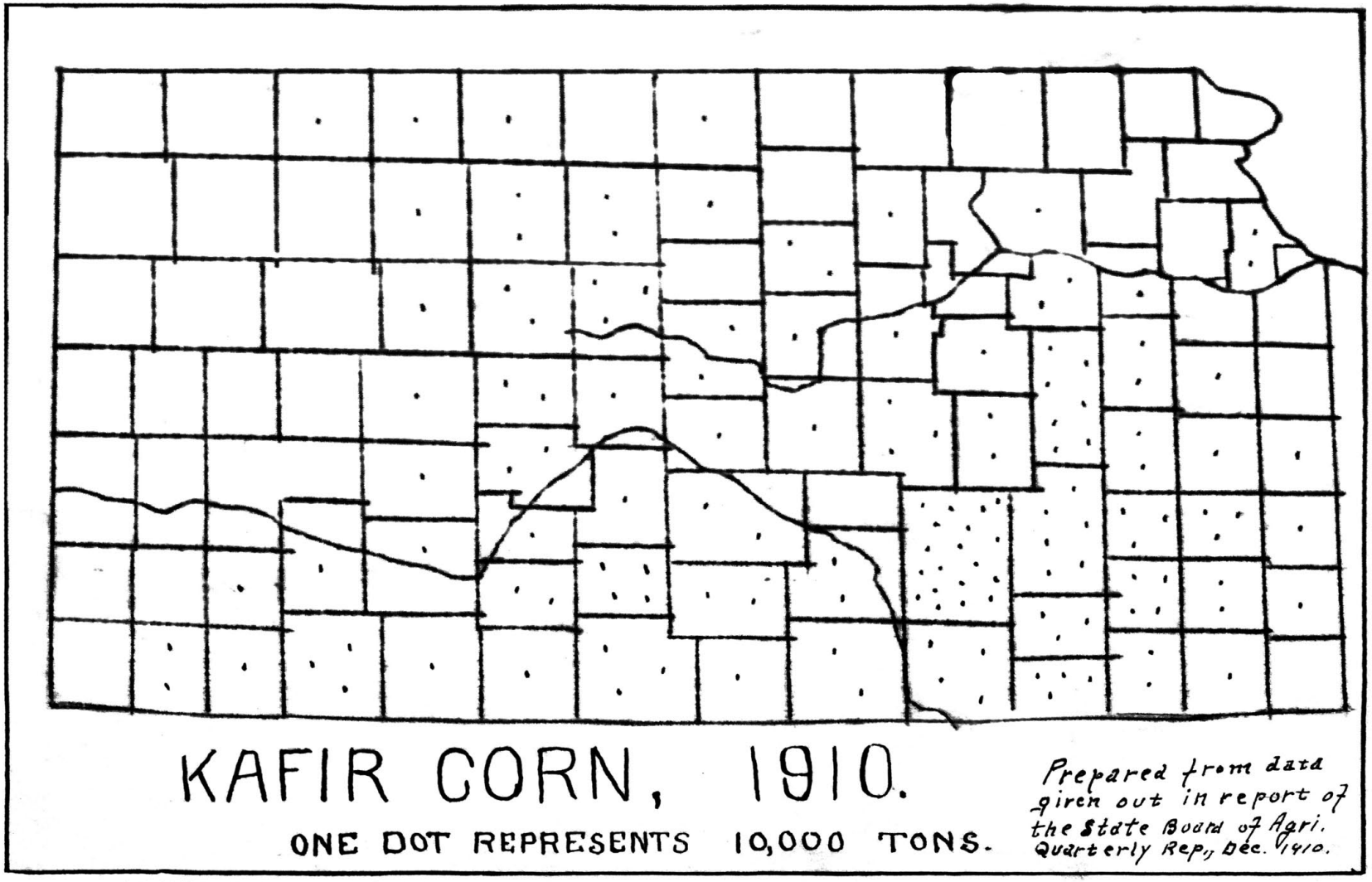
SCALE, — ONE CENTIMETER = 200,000 TONS. *



• ESTIMATED. - STATE REPORT FOR 1894 IS GIVEN IN BUSHELS.

* DATA FROM REPORTS OF THE STATE BOARD OF AGRICULTURE.

No. 14.



KAFIR CORN, 1910.

ONE DOT REPRESENTS 10,000 TONS.

Prepared from data given out in report of the State Board of Agri. Quarterly Rep., Dec. 1910.

LIVE STOCK.

The natural corollary of grain production in Kansas is stock-raising, - easily the second interest of the state. Since the early '80's the value of animals slaughtered and sold for slaughter has surpassed that of either corn or wheat. In the thirty years 1877-1907 the value grew from 10 to 97 millions of dollars.

Dairying, which competes with the raising of field crops for the farmer's time, has not been extensively engaged in.

On the whole sheep have had little favor and since 1890 have played an insignificant part. (See chart on the next page showing the number of the several kinds of live stock in the state since 1860.)

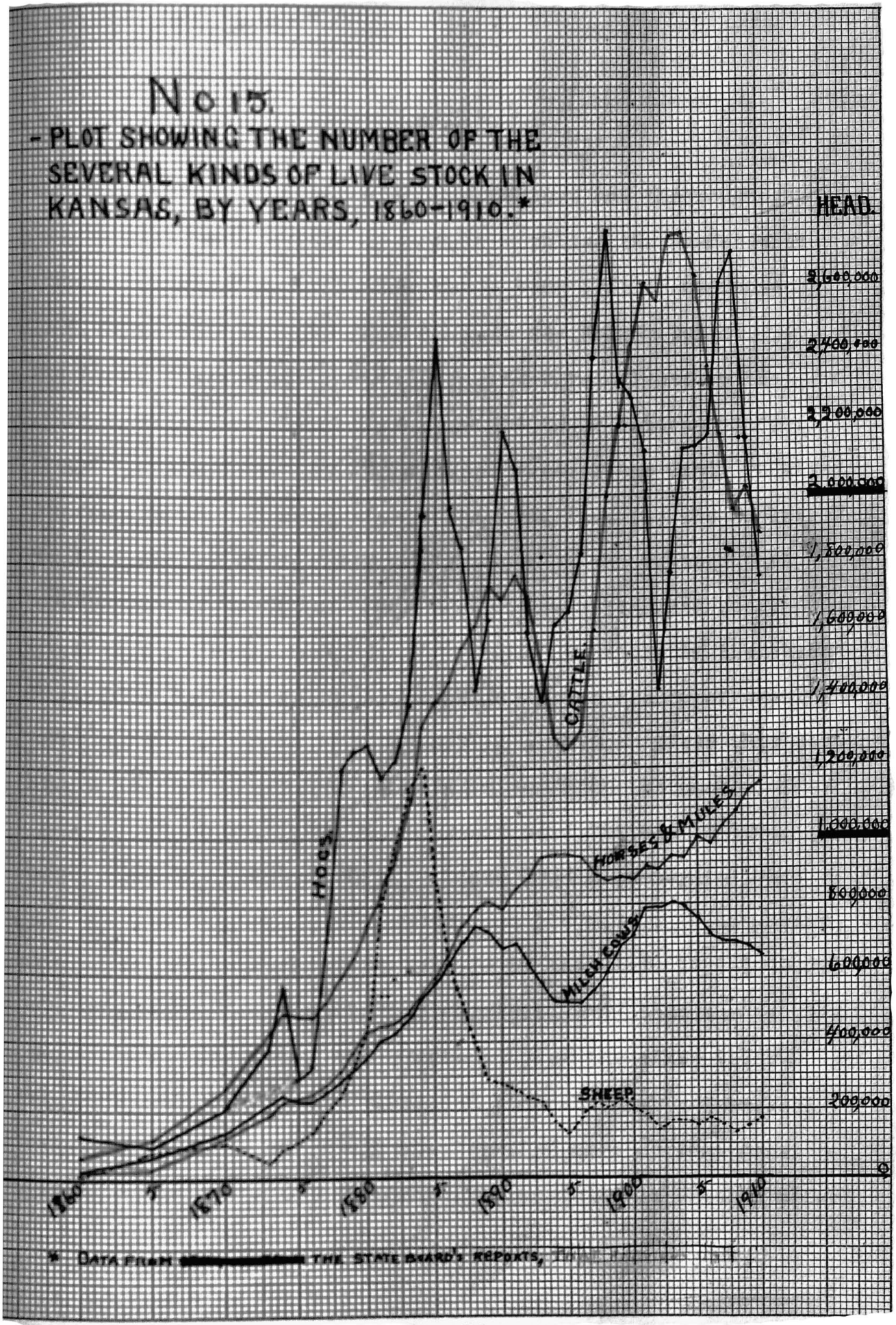
Value of live stock slaughtered and sold for slaughter in Kansas, 1877-1910. (State Reports.)

1877	$ 10,523,058.
1880	13,231,595.
1885	37,190,696.
1890	40,072,672.
1895	48,591,362.
1900	67,014,901.
1905	69,828,817.
1910	101,276,925.

Value of live stock in Kansas. (Federal Census.)

1860	$ 3,332,450.
1870	23,173,185.
1880	60,907,149.
1890	128,068,305.
1900	190,956,936.
1910	* 234,878,692.

* State Report.


No 15.
- PLOT SHOWING THE NUMBER OF THE SEVERAL KINDS OF LIVE STOCK IN KANSAS, BY YEARS, 1860-1910.*
HEAD.
2,600,000
2,400,000
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
CATTLE.
HOGS.
HORSES & MULES.
MILCH COWS.
SHEEP.
1860
5
1870
5
1880
5
1890
5
1900
5
1910
* DATA FROM THE STATE BOARD'S REPORTS,

CATTLE.

The former abundance of wild pasture and the roughage which has been replacing it have supplied the farmer with cheap "feeders" into which he has been able to condense his corn crop into about one-sixth its former weight. At first the cattle from the plains were shipped to the corn states east of the Mississippi to be fattened there. Later on the farms of the eastern part of the state received feeders from the western and prepared them for the market. It is only recently that the farmers of the western part of the state have been able to produce a finished beef.

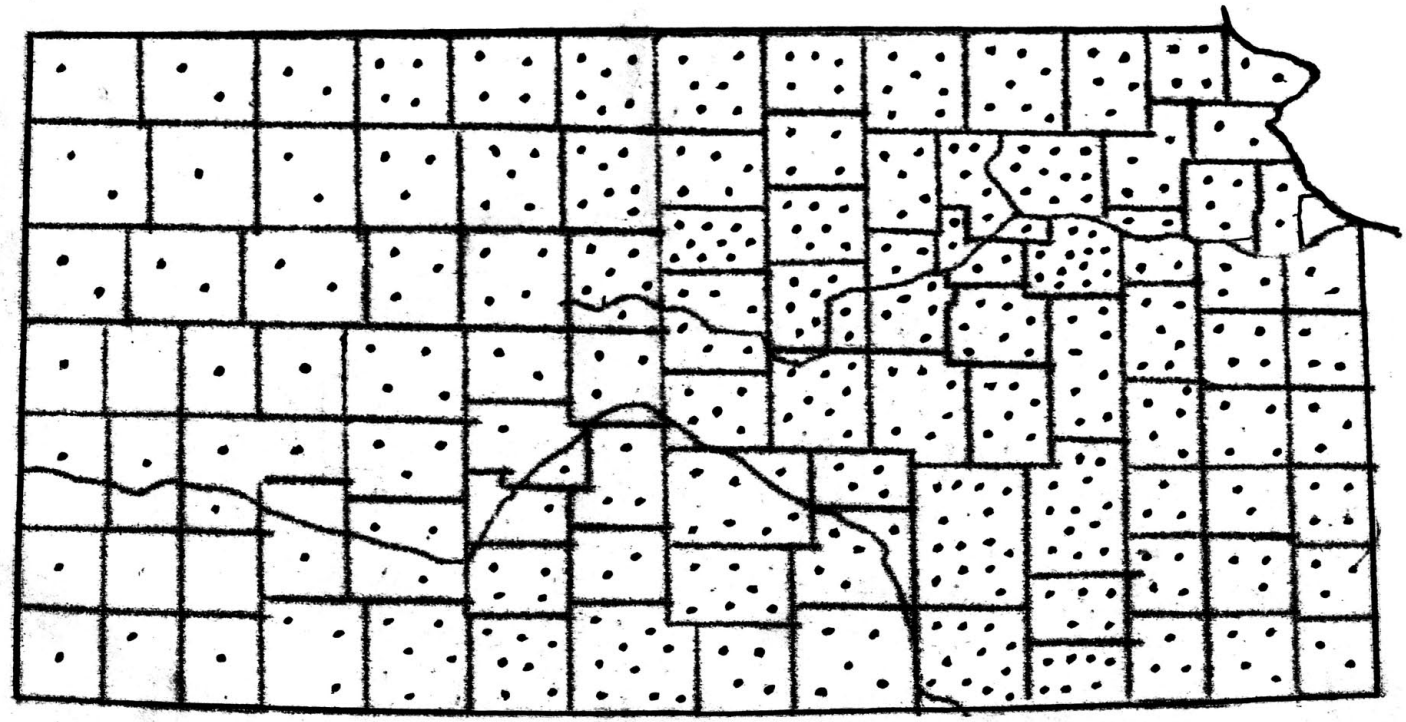
The steady increase of the number of cattle in the state from 1860 was broken in the 1889-1891 and a drop of nearly one-third the number followed before 1895. After this date there was another very rapid gain in which the number of head sprang from 1,258,919 in 1895 to 2,757,542 in 1904, more than doubling itself. Since 1904 a steady fall has placed the present (1910) number at 1,878,641. (See chart Number for graph of the number in the state 1860-1910.)

(The map on the following page will show that the cattle, milch cows excludéd, are scattered over the state tolerably evenly. From the Missouri line the number increases slightly toward the west, then remains more or less constant until a point about the 98th meridian is reached after

NO. 16.

DISTRIBUTION OF CATTLE, (MILCH COWS EXCLUDED.)

One dot representing 4,000 head. 1910.



From data in quar. rep. of S.B.A. Dec. 1910.

which it decreases to the west.)

Although the gain achieved in the cattle industry has been most noticeable in numbers, the whole state considered, due to increased settlement, better and more forage, added railway facilities, etc., yet a substantial advance has been made in selection and improvement of breed, especially on the larger cattle ranches of the central part of the state. Instead of simply rounding up the surplus grass-fed beeves from the range each year the stock-raiser and feeder now produce a quick-growing, grain-fed beef at a known, definite cost, in a manner quite analogous to any manufacturing process.

Between the years 1888 and 1895 milch cows declined in number in commmwith the other cattle, and since 1903 a second fall has taken place. (See plot Number 15.) Although the dairying of the state is chiefly for home consumption, yet the testing and breeding of superior types has been remarkable, especially since the introduction of the hand separators and the Babcock testers.

In 1860 the work oxen in Kansas outnumbered the horses. The number has been as follows: 48

1860 - - - - - - - - - - - - -	21,551
1870 - - - - - - - - - - - - -	20,774
1880 - - - - - - - --- - - - -	16,789
1890 - - - - - - - - - - - - -	4,495

HORSES AND MULES.

The number of horses in the state has grown from 18,882 in 1860, to 117,786 in 1870,[49] 367,589 in 1880, 716,459 in 1890, 786,888 in 1900, and 966,747 in 1910.[50] That this has exceeded the growth in settlement is shown by the increase of the head of horses per person engaged in agriculture, which has been as follows: [51].

1875 - - - - - - - - 2.17 horses per person eng'd. in agri.,
1885 - - - - - - - - 2.54 " " " " " " ,
1895 - - - - - - - - 4.59 " " " " " " ,
1905 - - - - - - - - 3.48 " " " " " " .

The number for the United States in 1880 was 1.7, and in 1900 2.3.

The number of horses per acre under cultivation has been: [52].

1860 - - - - - - - - .050; or 19.7 acres per horse,
1870 - - - - - - - - .041; " 24.3 " " " ,
1880 - - - - - - - - .033; " 30.3 " " " ,
1890 - - - - - - - - .029; " 34.5 " " " .

Through the influence of a scattered number of "fine-stock" raisers over the state a considerable movement for a better class of horses has been growing. With the increasing amount of capital in the state the farmers have the means and opportunity to breed a finer type of animal than was possible formerly.

Mules and asses have increased from 1,430 head in 1860 to 189,969 in 1910. Because of the continued high price of mules the last decade has seen a very rapid growth, the number being 89,064 in 1900 and 189,969 in 1910. Great

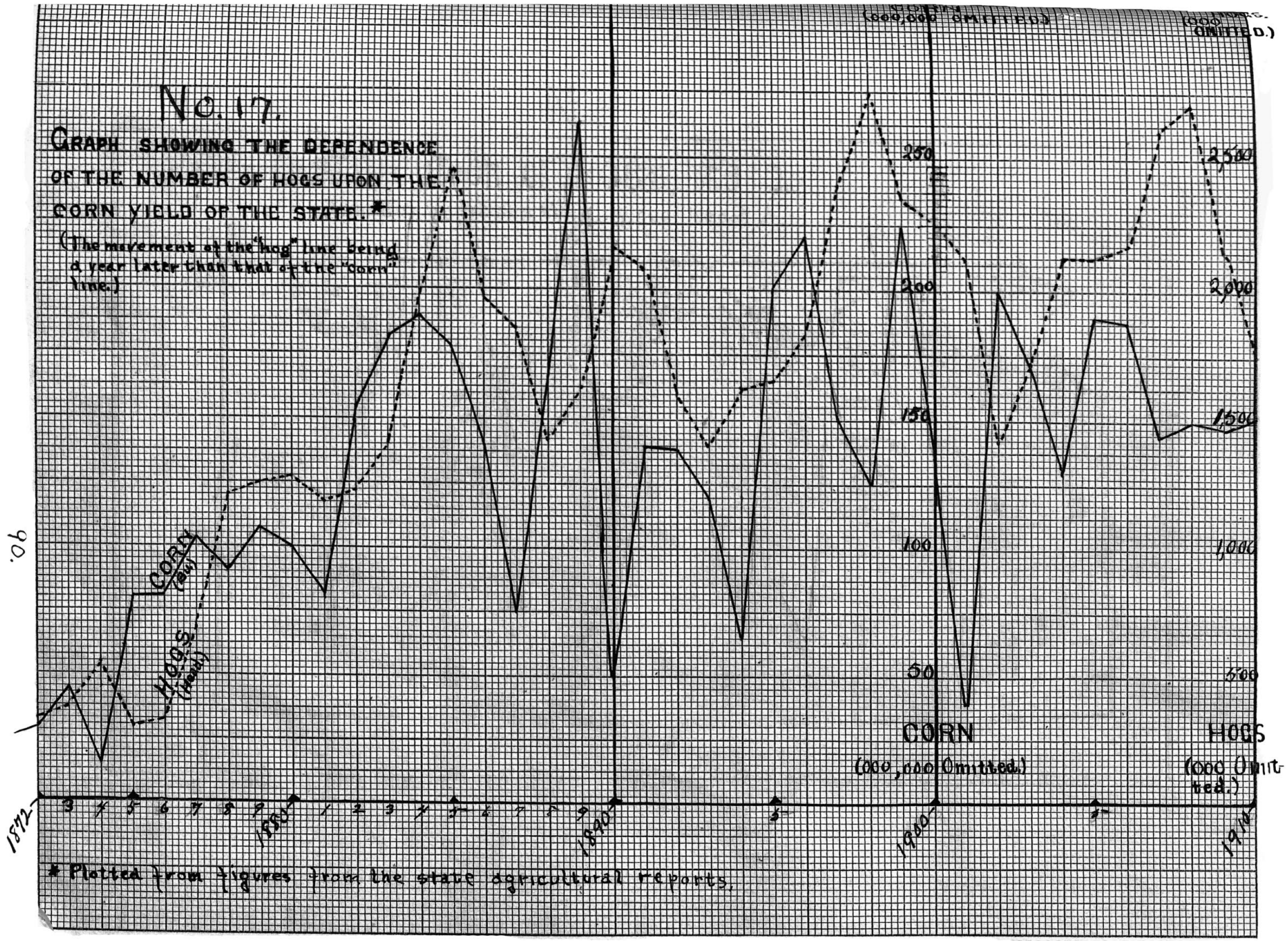
numbers of these are sold and shipped from the state.

SWINE.

Being preeminently a "corn" state Kansas is consequently a "hog" state. The close relation between the size of the corn crops and the number of hogs in the state the next year is shown in the plot on the following page. A short corn crop one year means a less production of hogs the next year; and so the dotted line representing the number of hogs in the state will follow largely the continuous line, which represents the number of bushels of corn, the movement of the hog line being a year later than the corn line. This relation is closest during the years 1860-1890, before the introduction of alfalfa, kafir corn, and other crops which are used in conjunction with corn in raising the hogs, - which also accounts for the fact that the number of hogs has raised in its proportion to the bushels of corn, since the '80's. (The other chart, Number 18, shows the distribution of the hogs over the state. The area covered will be seen to compare closely with the corn area in chart 5.)

The western part produces few head for the market. The lack of corn and the larger meshes of the railway net hamper the production other than for home consumption.

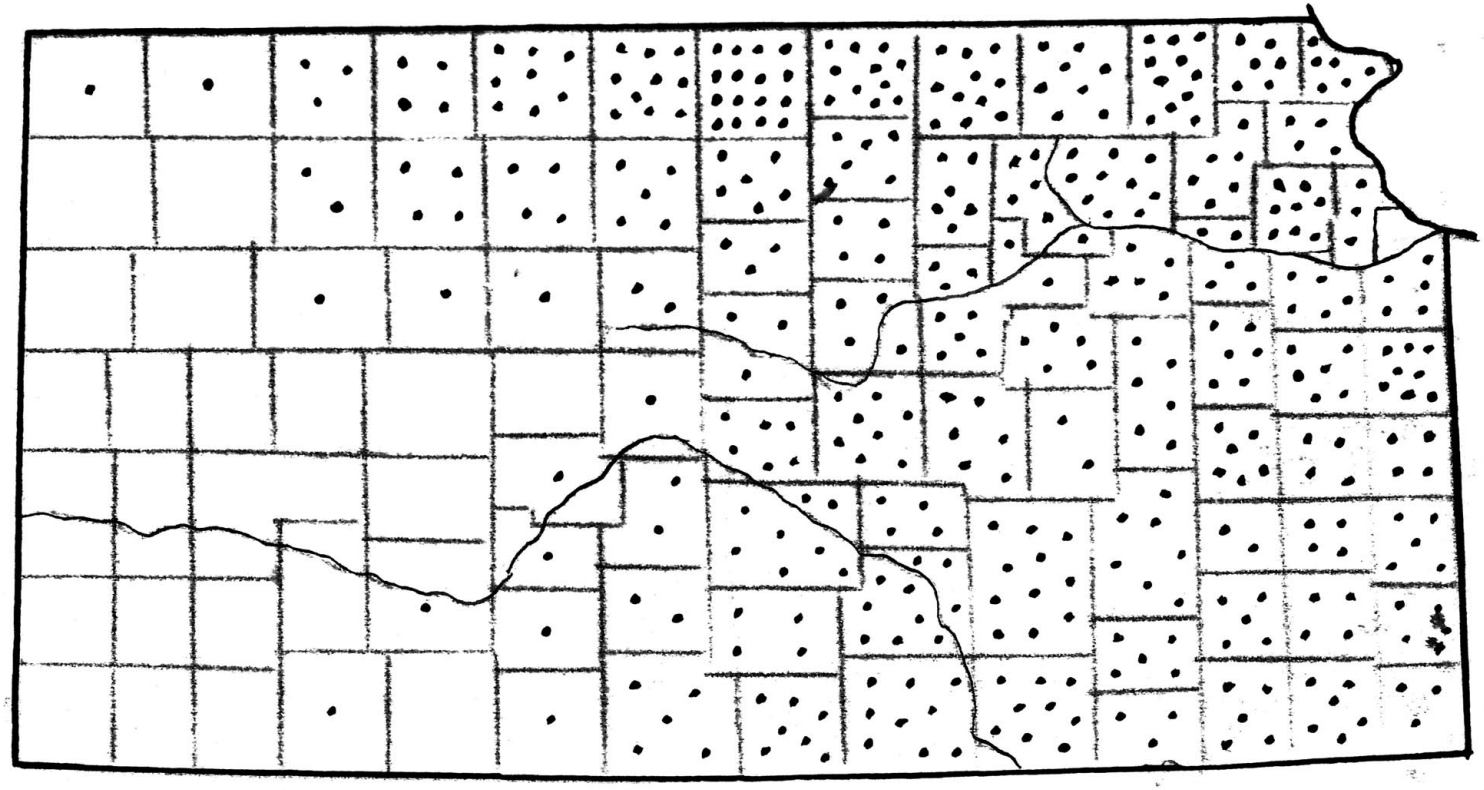
On plot Number 15 the hog line will be seen to be the most variable of all the farm animals, since the shorter


No. 17.
GRAPH SHOWING THE DEPENDENCE OF THE NUMBER OF HOGS UPON THE CORN YIELD OF THE STATE.*
(The movement of the "hog" line being a year later than that of the "corn" line.)
(000,000 OMITTED.)
(000 OMITTED.)
250
200
150
100
50
2500
2000
1500
1000
500
CORN (bus.)
HOGS (head)
CORN
(000,000 Omitted.)
HOGS
(000 Omitted.)
1872
1880
1890
1900
1910
* Plotted from figures from the state agricultural reports.

No. 18.

DISTRIBUTION OF HOGS, 1910,

One dot representing 4,000 head.



From data in quar. rep. of S.B.A. Dec. 1910.

time required to raise them and their greater prolificness make the number more responsive to influences of crops, prices, etc.

SHEEP.

Although sheep are of minor inportance in Kansas their history here is interesting. From a number of 51,166 in 1873 they rose abruptly to 1,206,297 in 1884, and then fell as abruptly to 136,520 in 1895, since which time their line in Plot Number 14 has been a wavy one, mostly below 200,000, and ending at 175,250 in 1910. (In the map following their distribution through the counties in 1910 is shown. This, though ,can not be depended upon for more than the one year, since the sheep industry in the state fluctuates much, few farmers making a permanent business of raising sheep. A large number may be shipped into a locality one year and fed; if the operation proves unprofitable the next year will see very few there. For instance, in 1909 Mitchell county reported 10,384 head, and in 1910 only 4,612; Reno 5,180 in 1909, and 1,881 in 1910. Stanton showed 1,012 in 1909, and 11,512 in 1910.)

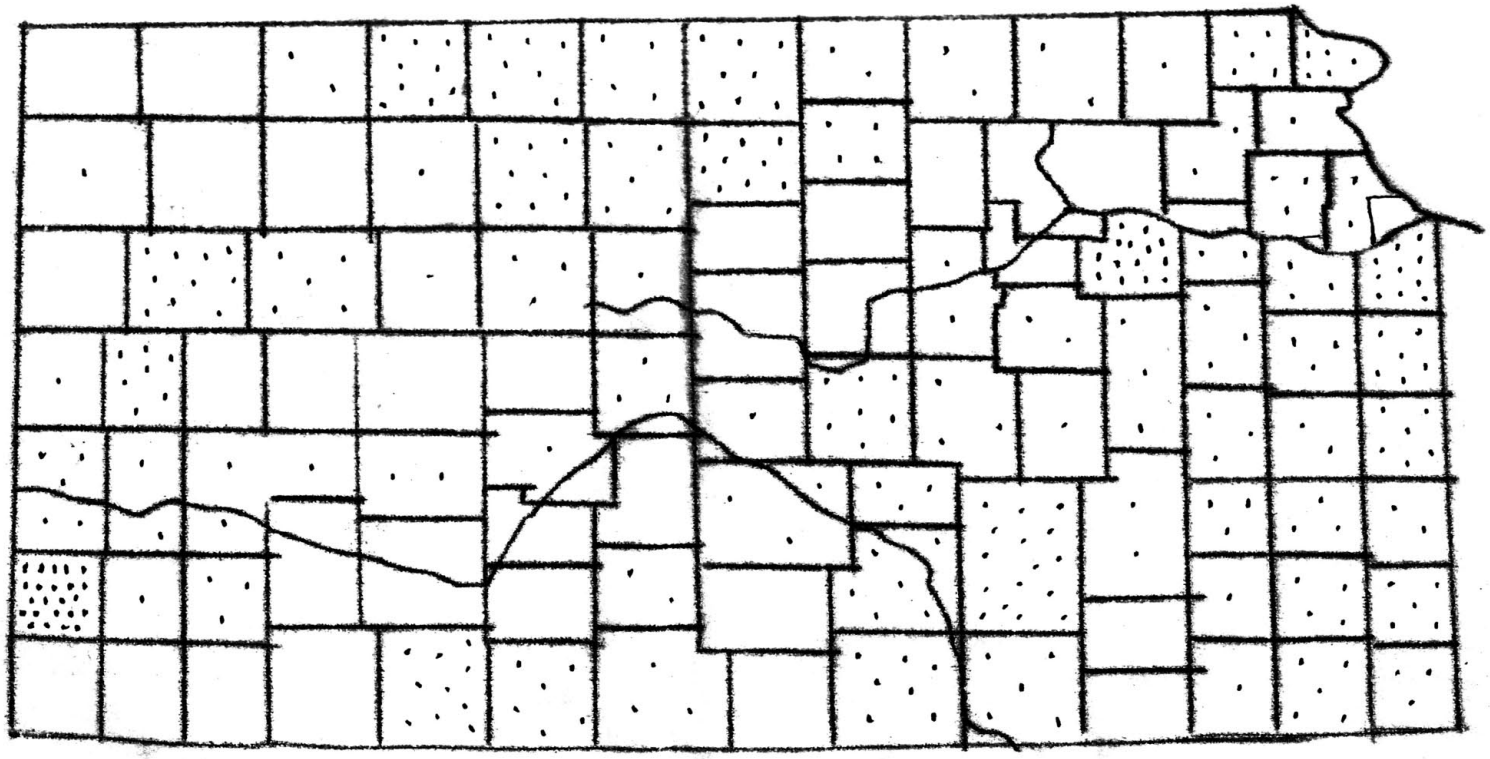
A great quantity and variety of poultry find feed in the plentiful grain and besides furnishing the owners eggs and meat have yielded an increasing revenue from the market : 53.

1880 - - - - - - - - -	$ 531,550
1890 - - - - --- - -	2,259,998
1900 - - - - - - - - -	5,060,332
1910 - - - - - - - - -	10,789,832.

No. 19.

DISTRIBUTION OF SHEEP, 1910,

ONE DOT REPRESENTING 500 HEAD.



Prepared from data in the quarterly report of the State Board of Agri. Dec. 1910.

MACHINERY.

Agriculture began in earnest in the Great Plains just in time to avail itself of the greatest revolution in farm machinery which the world has seen. Between 1855 and 1894 the time required to produce one bushel of corn declined on an average from 4 hours and 34 minutes; and the labor-cost from 35 3/4 to 10 1/2 cents. The gang plow, the disk harrow, the corn planter, the corn binder, the husker and shredder, run by steam power, and the sheller, also steam-propelled and shelling one hundred times as fast as one man had formerly been able to shell, - all these marked a tremendous change in corn production.

In 1830 the average time required for one man to produce a bushel of wheat was 3 hours and 3 minutes, in 1896 it was only 10 minutes, so great had been the effects of improved machinery. The cost of the human labor fall from 17 3/4 to 3 1/3 cents.

The time of human labor required harvest and bale one ton of hay in 1860 was 35 1/2 hours; in 1894 it was 11 hours and 34 minutes, the cost falling from $3.06 to $1.29. For mowing and curing the grass the time of human labor required has fallen from 11 hours to 1 hour and 39 minutes.

The total potential saving in the cost of producing the seven principal crops in the United States (corn, wheat, oats, rye, barley, white potatoes, and hay), is estimated at $681,471,827, for 1899 as compared with the old-time processes.

The larger, more advanced types of machinery, such as the steam plow, husker and shredder, have but a very limited use in the state. The husking is done by hand and the bulk of the stocks is left on the field. The corn-binder is increasing in numbers at a very rapid date, the gang plow is quite generally seen, and the self-binder is a necessity. Hay loaders, stackers, forks and slings are to be found on every farm of any amount of mow-land. The movement in farm machinery has been from wood to iron, from iron to steel, and from large patterns to small ones.

From 1860 to 1895 the prices of farm implements declined in spite of the increase in efficiency, durability, lightness and strength. The cost of the different machines and of wire fencing fell from 1/4 - 3/4 of the former cost.

" Special investigations of the Labor Bureau have led to the conclusion that by the use of machinery the effectiveness of human labor has been nearly, if not quite, doubled since the middle of the century." (12th Census, Vol. V., p. XXXI.)

Value of farm implements and machinery in Kansas.
(Nat'l. Cen.)

1860	$ 727,694.
1870	4,053,312.
1880	15,652,848.
1890	18,869,790.
1900	29,490,580.
1910	48,244,000.

Value of farm implements and machinery in Kansas -

Year	Per Farm.	Per Acre.	Per Farm For The U. S.
1860 -$	- - -	-$ 1.95	- -$
1870 -	106.10	- 2.98	- -
1880 -	112,82	- 1.76	- - 101.
1890 -	113.25	- 1.19	- - 108.
1900 -	170.37	- 1.27	- - 133.
1910 -	272.10	- 1.44	- -

(Values and number of farms for the above taken from the Nat'l. Census, area from state census.)

In the above table the state shows an interesting movement in ppposition to that of the country at large, the value of farm machinery per acre having decreased since 1870. This comes from the adoption of the more efficient implements which admit of a more than proportionate increase of ground tilled, and from a surface peculiarly adapted to large scale production. Since 1850 the value for the United States has increased about 80%, per acre. The tendency for the last twenty years in the state probably indicates that the application of machinery of the larger types has overtaken the acreage expansion.

The value of farm machinery per person over 10 years of age engaged in agriculture in Kansas has been: 57.

1860- - - - - - -$	37.83
1870- - - - - - -	55.35
1880- - - - - - -	75.95
1890- - - - - - -	75.17
1900- - - - - - -	108.72

Because of the great increase in value of machinery for 1910 the value per person will be found to be close to $150 for the year 1910.

IMPROVEMENTS.

The total value of farm buildings was given in 1900 as $111,864,000, and in 1910 as $199,101,000 by the National Census Reports. Kansas and Nebraska, IN 1900 each showed a greater value, OF BUILDINGS ON HAY AND GRAIN FARMS than did Missouri, lying entirely outside of the plains, and being an older state.* It is patent that the increase has been very great, especially since the middle nineties, in the number and quality of farm houses, barns, cribs, granaries, fences, silos, etc. The surplus income of the farmers' is being put back into larger and better buildings, and fencings. The hedges of Osage Orange which were resorted to in the early days as the cheapest and most available means of fencing are being killed out and replaced by wire, which does not shade and rob the soil and permits of the cultivation of from three to five acres more per mile of fence.

Today throughout the state as good barns and general farm improvements are to be found as in any of the states, and their establishment means that the bona fide agriculturalist has settled in this region to stay, with means and fonds to tide over such drouths and pests as depopulated counties in the earlier days.

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* 12TH CENSUS, VOL. VI, p. 18.

CROP ROTATION.

Crop rotation is becoming the most important problem of the Great Plains. The question is so to arrange the order of the crops to be grown upon a field as best to preserve the soil qualities and thus secure the largest return throughout a continuous cultivation.

The main crops of this region when grouped under the three arbitrary heads of "exhaustive", " intermediate", and "restorative", are: 5-8

Exhaustive	Intermediate.	Restorative.
Wheat	Sorghums	Corn
Oats	Kafir	Alfalfa
Barley	Cane	Clover
Rye	Milo	Potatoes
Millet		Peas
		Beans

These are not fast distinctions, but are in the main true. The problem of crop sequence is to determine the proper order in which to combine these crops. Although oats and corn are both exhaustive crops, oats following wheat in a system give better results than does wheat following oats. Work upon crop rotation has been carried on by the Office of Dry-Land Agricultural Investigations, of the Bureau of Plant Industry, since the spring of 1906 at eleven stations in the Great Plains district, (See Chart No. 1 .), and its Bulletin No. 187, of June 1910 gives some valuable conclusions regarding this topic. The adoption of these will

work a great good for the farming. This is only one of the many lines which progress is now pursuing for the welfare of this region, which in the next quarter-century will witness a tremendous advance. Crop rotation and dry-farming are proceeding together and form the most important progress in methods which is occurring today.

VALUES, ETC.

1. Value of Kansas properties and products.

Year	Assessed Valuation*, in millions, of - Lands	Personal	City Lots	Ry.	Total.
1861 -	$ - -	$ - -	$ - -	- -	$ 24.7
1870 -	48.7	26.6	16.2	- -	91.6
1875 -	71.9	19.4	17.9	12.3	121.5
1880 -	87.1	31.9	20.9	20.5	160.5
1885 -	122.8	56.5	38.4	30.3	248.1
1890 -	168.3	48.7	72.8	57.8	347.7
1896 -	166.6	36.1	59.0	59.3	321.1
1900 -	163.3	56.6	61.4	59.2	340.6
1905 -	174.8	69.3	72.6	65.1	381.9
1910 -	1,351.9**	554.1**	424.6**	420.1**	2,750.8**

(From reports of the State Board of A

* From 1/5 to 1/2 actual value.
** Actual value as determined by the State Tax Commission.

The cash value of farms (lands, buildings, fences) in the state by National Census is:

1860 - - - -	$ 12,258,230.
1870 - - - -	90,327,040.
1880 - - - -	235,178,936.
1890 - - - -	559,726,046.
1900 - - - -	643,652,770.
1910 - - - -	1,733,653,000.

The value of farm improvements, live stock, crops, etc., has been given under the respective heads, and it will suffice here to give merely a summary and comparison of the value of the field crops and of live stock products, together with the total. 59

Year	Field crops	Live stock products	Total farm products*
1875	$ 43,970,494.	$ - - - - - - -	$ - - - - - -
1880	66,823,289.	13,231,595.	80,044,884.
1885	85,624,348.	37,190,646.	122,814,994.
1890	81,054,973.	40,072,672.	121,127,645.
1895	79,912,429.	48,591,363.	128,503,792.
1900	120,781,498.	67,014,901.	187,796,399.
1905	169,007,619.	69,828,807.	238,836,426.
1910	203,637,417.	101,276,925.	304,912,342.

* Does not include live stock on hand.

2. Size of farms, and tenancy.

Number and average size of farms of Kansas. (Nat'l. Gen.

Year	Number	Average size	Average size for U. S.
1860	38,	171 acres	199.2 acres
1870	38,202	148 "	153.3 "
1880	138,561	155 "	133.7 "
1890	166,617	181 "	136.5 "
1900	173,098	240.7 "	146.6 "
1910	177,299	244 "	- - -

Since 1870 the size of the farms has increased rapidly until in 1910 instead of being below the average for the United States as it was in 1870 it is nearly one hundred acres above it. The North Central section of states, of which Kansas is a member, had an average per-farm acreage in 1900 of only 144.5

Number of farms according to size. (Nat'l. Cen.)

Acres	NO. of farms in - 1900	1910	Per cent of whole in - 1900	1910.
- - 19	7,006	7,915	4	4
20-49	12,269	10,669	7	6
50-99	32,103	26,082	19	15
100-174	58,421	57,637	34	33
175-499	50,845	61,194	29	34
500-999	8,895	10,459	:5	6
1000--	3,559	3,343	2	2

Before 1880 the Federal Census took no account of the tenancy of farms.

Per cent of all farms farmed by —

Year	owners	share tenants	cash tenants.
1880	83.6 %	13.1 %	3.3 %
1890	71.77	22.17	6.06
1900	65.	25.	10.
1910	62.	38	

60.

In common with the movement throughout the Miasissippi valley farm ownership by the operators in Kansas is decreasing, In 1880 only 16.4 per cent of the farmers were renters; in 1910, thirty years later, 38 per cent rented the farms they cultivated. Throughout the state there is a pronounced movement of the older settlers to the towns, renting their farms and living upon the proceeds. The high price of land is making it difficult and often unprofitable for the actual cultivator to own the land upon which he works, and an increasing number are compelled to rent for a number of years at least, until they can command the capital with which to purchase. Much of the land

is being held for speculation and the rent asked is less than the tenant woulb be compelled to pay as interest if he should borrow funds and buy the land.

In the past decade 1900-1910 the per cent of tenants to total farmers increased in Illinois from 39 to 41; in Iowa from 35 to 38; and in Minnesota from 17 to 21. 61

The number of non-white farmers in the state is decreasing, being 1,866 in 1900, and 1,681 in 1910, - only one per cent of the total number. In 1910 1,326 farms were operated by managers.

Of the 110,742 farms operated by the "all owner" class in 1910 61,500, or 56% were reported as owned free of incumbrance, leaving 44% mortgaged.

3. Population.

Population of Kansas. (From reports of State Bd.of A.

1855 - - -	8,601	1885 - - -	1,268,530
1860 - - -	107,206	1890 - - -	1,423,485
1866 - - -	140,179	1895 - - -	1,334,734
1870 - - -	364,399	1900 - - -	1,444,708
1875 - - -	528,437	1905 - - -	1,544,968
1880 - - -	996,096	1910 - - -	1,696,361

About 40% of the last ten years' gain has been in the western third of the state. The counties of Kearney and Clark increased in population nearly 200 per cent; Meade 230; Stevens and Morton 300; Seward 500, the largest gain being in the south-western counties. Fourteen of these more than doubled their population. In a large measure this has been a re-peopling of the region depopulated in

the '90's, after the collapse of the boom.

Agricultural population.of Kansas.

Year	No. over 21 yrs,' by state census.'	% of those eng'd. in all occupat'ns.'	'No. over 10 'Nat'l Cen.
1860	- - - - - - - - -	- - - -	19,232
1870	- - - - - - - - -	- - - -	73,228
1875	95,476	67.2	- - - -
1880	- - - - - - - - -	- - - -	206,080
1885	202,279	60.9	- - - -
1890	- - - - - - - - -	- - - -	250,999
1895	185,394	54.1	- - - -
1900	- - - - - - - - -	- - - -	271,252
1905	251,965	50.3	- - - -

(From state decennial censuses.)

The decrease of the agricultural population in 1895 is explained by a decrease of nearly 7 per cent in the number engaged in agriculture to the total number engaged, coupled with a fall of 4 per cent in the population reported as being angaged in business of all kinds. From 1895 to 1905 the proportion of the total engaged in all occupations to the total population increased by almost 10 per cent. The following table shows the movement.

62.

	1885	1895	1905
Total Population. - - - - - -	1,268,530	1,334,734	1,544,908
No. 21 yrs. or over. - - - - -	800,183	668,568	827,694
Per cent 21, or over. - -	47.31	50.09	53.57
No. engaged in all occup'ns. -	331,694	342,576	500,059
P.c. engd. to all over 21.	55.26	51.25	60.41
No. engd. in agriculture. - -	202,279	185,394	251,956
P.c. of all engd. - - - -	60.98	54.12	50.38

(See map on the next page for the per cent of the state under cultivation by decades.)

No. 20.

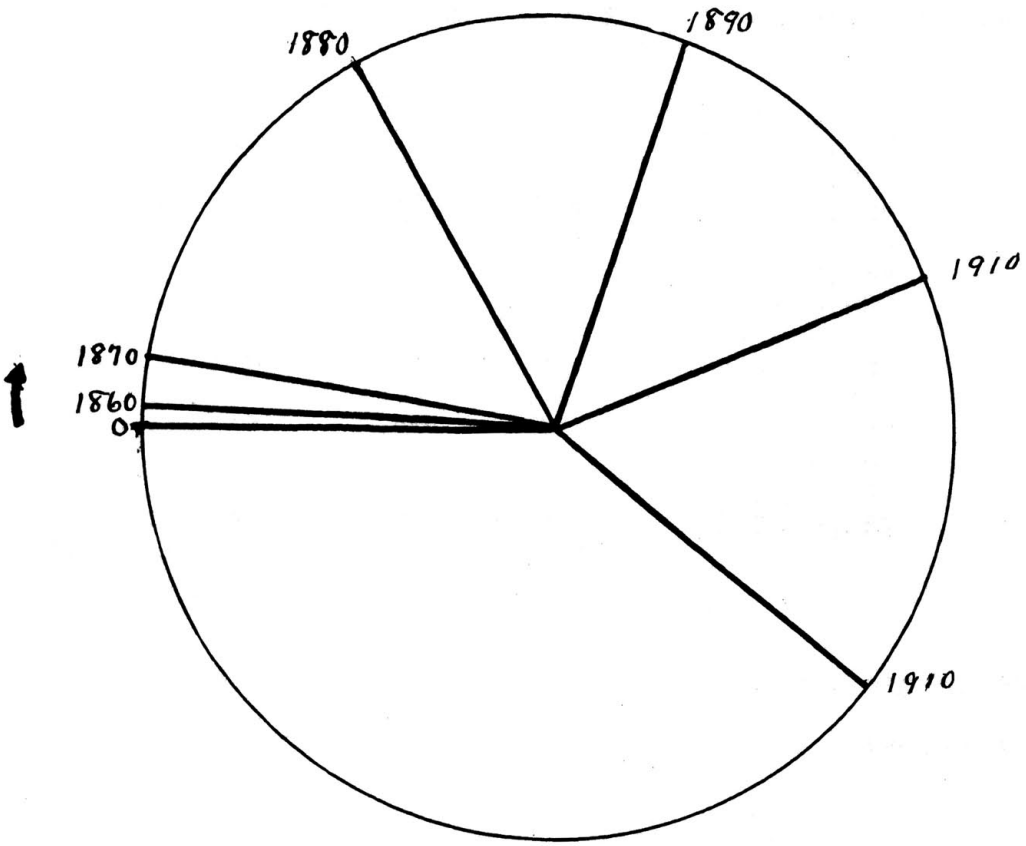

DIAGRAM SHOWING THE PROPORTION OF THE STATE UNDER CULTIVATION, i. e., the area from which crops were taken, by decades.

Total area of state is 52,572,160 acres. The number of acres under cultivation has been, - in

1860 - 372,835, or .70%;
1870 - 1,360,000, or 2.58%;
1880 - 8,868,885, or 16.85%;
1890 - 15,929,654, or 30.30%;
1900 - 23,207,774, or 44.01%;
1910 - 33,394,799, or 63.52%. 63.

Miles of railway in the state. (Poor's Railway Manual.)

1864 - 40	1880- 3,400	1896- 8,877
1865 - 40	1881- 3,609	1897- 8,843
1866 - 240	1882- 3,820	1898- 8,796
1867 - 494	1883- 3,964	1899- 8,749
1868 - 648	1884- 4,033	1900- 8,714
1869 - 931	1885- 4,520	1901- 8,744
1870 -1,501	1886- 6,017	1902- 8,803
1871 -1,760	1887- 8,194	1903- 8,811
1872 -2,063	1888- 8,754	1904- 8,841
1873 -2,100	1889- 8,810	1905- 8,874
1874 -2,150	1890- 8,892	1906- 8,894
1875 -2,150	1891- 8,890	1907- 8,907
1876 -2,238	1892- 8,893	1908- 8,914
1877 -2,352	1893- 8,931	1909- 9,058
1878 -2,427	1894- 8,872	
1879 -3,103	1895- 8,875	

(See Chart No. 4 for graph of the railway mileage, and its relation to the population and cultivated area graphs.)

Since 1890 practically no mileage has been built in the state, and the movement has been along the line of improving the lines so hastily constructed in the two preceeding decades.

NEEDS.

One can not come forward and flatly name a list of troubles which affect the pursuit of any industry and propose a series of remedies which whold absolutely and unreservedly correct the evils or hindrances existing. Men who have spent their lives in the work are doing their utmost to perfect the agricultural operations of the state. They know the work from first to last, and, we may be sure, make use of every corrective policy available. Yet there are certain patent needs of the farm which are generally admitted and toward whose satisfaction all thoughtful ones are striving.

The first step of the evolution of farming in any new country is one of exploitation of the soil by a system of one or two crops, the ones being chosen which are the most profitable. Kansas has been passing through this period in typical fashion. But any farming must embrace an appropriate animal husbandry if it is to be permanently profitable, especially if its other interest be the production of the grains. The fact probably needs a more general recognition in the state that the cheapest as well as the best way of maintaining fertility in the soil is through the use of manures from the feed-yard where the rich fodders and grains are converted into meat. Thus the feeding, which condenses the grain to about one-sixth its original weight, and can be made to yield a profit in itself, furnishes a continued

richness of soil for the production of the field crops. So, from all evidences the farming of the state would profit by increased attention to live stock and a fuller utilization of the manures. The fact that in 1910 only $73,000 was spent for commercial fertilizers while $268,000 was expended in 1900 evidently points to a tendency in the right direction, i. e., more extensive use of feed-yard manures.

Another need closely linked with the one mentioned above is that the farmer become more permanently attached to the soil. For in this way only will he be interested in the preservation of the fertility of the land and look for returns other than for the present year. The owner who rents out his land will not invest the capital in buildings, fences, draining, fertilizers, etc., which he would if he were operating the farm and expected to for years to come. The present increase of tenants over owners upon the farms of the state seems to operate against the amelioration of the above trouble and may defer it until a late date. The farm must become the "home", the permanent, ancestral "homestead", and not simply a piece of ground to be knocked about between landlord and renter, each trying to get the most out of it for the time being, if the most is to be secured from the state's farming.

More attention should be paid to the rotation of crops and the practice made more general. Each section and soil has its own troubles, and although general principles can be given out yet each farmer must select and perfect a system for himself. The practice of systematic crop rotation is gaining ground and under the work of the Office of Dry-Land Agricultural Investigations will continue to do so.

Another line of development to be encouraged now is the increase of the leguminous crops for their nitrogen producing powers. Alfalfa, cow peas, soy-beans, clover, etc,, can profitably be given a larger place on the farm, - which will come with orderly crop rotation.

The value lost through the corn stocks left in the fields of the state each year would doubtlessly surprise us if it could be stated. An increased use of corn shredders and silos for utilizing the corn stover is being made and is wholly advisable and profitable.

Probably the fact deserves fuller recognition in the state that neither wheat nor corn should be made a specialty. Kansas is not a state for specialization, nor a single crop system. Its variableness in climate demands a combination of crops of diverse requirements if stability of returns is to be secured and disaster averted. In 1893 one-sixth of the wheat crop was fed to farm animals. 64

A better grass giving permanent pasture is needed for the central portion of the state to aid in stock-raising and thus diversify the one-crop (wheat) system, enrich the soil, and utilize the farmer's time during the months not given to wheat.

As an aid to the solution of all farm problems and the detection of profitable and unprofitable operations some definite system of keeping accounts and records should be adopted by every one operating a farm. The number of farmers keeping any such record or account seems very small, and herein lies much reason for the slowness to detect and correct unprofitable practices.

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